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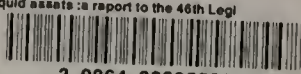
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A Report to the
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Water Resources
Division

Montana Department
of Natural Resources
and Conservation

March
1979

P R E F A C E

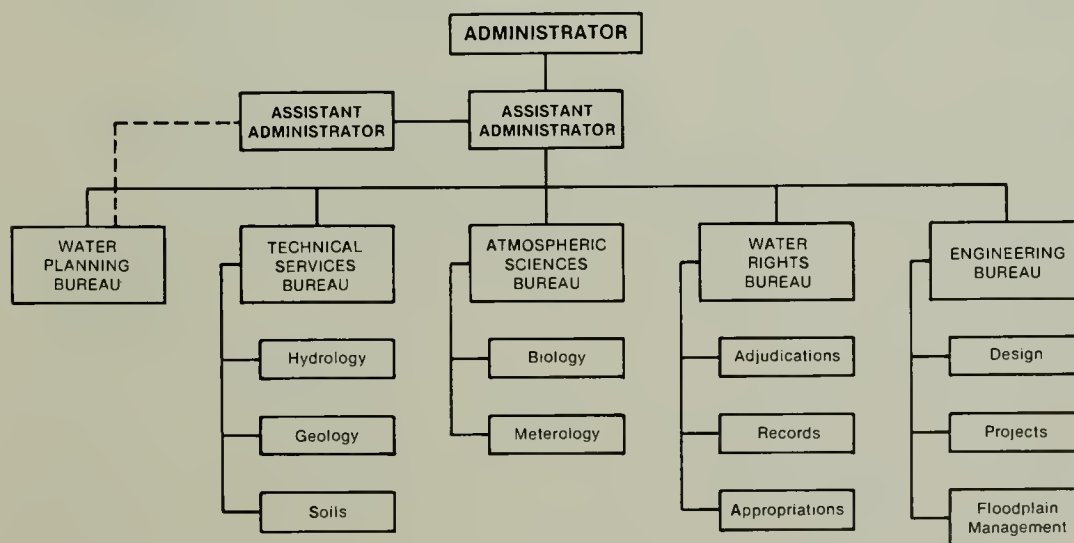
The Department of Natural Resources and Conservation (DNRC) has prepared this report of the activities of its Water Resources Division in response to House Bill 145, passed by the Forty-fifth Montana Legislature in 1977.

HB 145, the general appropriation act, which included appropriation to DNRC, directed the Water Resources Division to submit a detailed program report to the 1979 legislature, presenting specific activities and their cost together with an evaluation of the accomplishments of the division. Throughout this report major accomplishments and recommendations are indicated by a star (★).

The Water Resources Division was budgeted approximately \$2.69 million for fiscal year 1979. This budget consists of approximately \$1.7 million from the general fund, \$450,000 from federal revenue funds, and \$550,000 other funds (primarily grants under the Renewable Resource Development Program). Detailed budget information is presented in Appendix II.

The Water Resources Division is divided into five bureaus: Water Planning, Engineering, Technical Services, Atmospheric Sciences and Water Rights. Currently the division is authorized 117 full time equivalent positions. Twenty-two of these positions are federal Comprehensive Employment and Training Act (CETA) positions which are scheduled to terminate prior to June 30, 1979.

Because water is vital to the economic, social and environmental needs of Montana, legislative concern about what Montana's government is doing to utilize and protect our water resources is indeed most appropriate. DNRC welcomes the opportunity to present to the legislature this report on the activities of the Water Resources Division.



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CHAPTER 1 WATER PLANNING

☆ The Water Resources Division is responsible for preparing the State Water Plan which establishes a program for the conservation, development and utilization of Montana's water resources and proposes the most effective means by which these water resources may be applied for the benefit of Montanans (p. 1).

☆ Montana must be able to control its own water-use destiny in an era that has seen increased water resource awareness and conflict (p. 1).

☆ The Water Planning Program has ensured that Montana's interests are represented in interstate compact negotiations, international water apportionment activities, national water policy and interstate water resource programs and projects. The program has projected future water requirements, formulated plans and alternatives, identified water storage needs and recommended methods of implementing water resources programs and projects (p. 2).

☆ Of the 43,899,580 acre-feet of water that flows out of Montana each year, 28,465,950 acre-feet originate in Montana. About 12,975,000 acre-feet of water per year are diverted from Montana streams for irrigation, municipal, industrial and livestock use, with almost 5,990,000 acre-feet being consumed. Well over 90 percent of the water diverted and consumed is for irrigation use on 2,424,900 acres (p. 2).

☆ A detailed accumulation of knowledge about water and related land resources within the state, their present management and use is contained in 12 inventory series reports which have been published by the Water Resources Division (p. 2).

☆ The Water Resources Division, in order to formulate a State Water Plan, has set guidelines to determine the nature of investigations to be accomplished. To a large extent these guidelines will influence the outcome of the study. They reflect important public policy and, by directing planners, eliminate time wasted in unacceptable planning efforts (p. 4).

☆ Montana's interests in water use will receive priority although federal and regional interests will be recognized (p. 4).

☆ A study of the possibilities of diverting water to the Milk River indicated a need for a supplemental flow in the Milk River and identified and analyzed four alternatives to supply extra water to the river (p. 6).

☆ Results of a study of the upper portion of the Flathead River basin and the northern portion of Flathead Lake indicated that Canadian coal development could adversely affect water quality and fish and wildlife habitat in northwestern Montana and change the form of the river channel downstream (p. 6).

☆ The information gathered for the *Yellowstone Impact Study* has been used for a number of moratorium-related projects including the environmental impact statement for water reservations in the Yellowstone River basin (p. 6).

☆ The Water Resources Division provided an analysis of water supply and demand trends, projections and the potential effect of future water use on Montana's economic future (p. 7).

☆ The Water Resources Division, in cooperation with the Soil Conservation Service of the U.S. Department of Agriculture, is identifying the potential for development of irrigable lands in the Missouri River basin. The opportunity for both private and project development will be analyzed based on water availability and economic feasibility (p. 7).

☆ A report has been submitted to the legislature discussing the possibility of conducting joint water studies with Wyoming and the Crow and Northern Cheyenne Indian tribes, analyzing water marketing potential and evaluating the effect water development might have on water quality within the Tongue and Powder River basins (p. 7).

☆ The Water Resources Division has identified numerous potential reservoir sites in the Big Hole River basin and evaluated the feasibility of each site for development (p. 7).

☆ An interstate committee has been formed to unravel the complex issues of the Yellowstone River Compact. The committee's duty is to provide a practical means of day-to-day operation of the compact, and to estimate how much water is available to Montana and Wyoming in each of the four tributaries (p. 8).

☆ The International Souris-Red Rivers Engineering Board of the International Joint Commission is in the process of establishing a task force and recommending an apportionment of the flows of Beaver Creek, Big Muddy Creek, and the tributaries of both streams that cross the International Boundary (p. 9).

☆ There is no compact in effect between Montana and downstream states regarding the Missouri River (p. 9).

☆ While Montana's interests have been protected in a number of situations, the water planning staff is not sufficient to parry each thrust at Montana's water nor become deeply involved in all water resources issues (p. 11).

CHAPTER 2 WATER RIGHTS

☆ From July 1, 1973 to January 1, 1979, 5,150 applications for water use permits were received and a total of 4,205 provisional permits were issued by the Water Rights Bureau. Applications have been submitted at the rate of about 1,100 per year during the last two years (p. 13).

☆ Through a reorganization of existing staff, water rights field offices were established to serve most Montana counties. Providing local assistance has greatly increased productivity and decreased processing time (p. 13).

☆ In the last fiscal year objections were received on about 300 of the 950 applications processed; about 80 progressed to the hearing stage. As water becomes more fully appropriated these hearings, which cost \$1,500 to \$2,000, will increase in number (p. 16).

☆ There is generally a lack of information quantifying existing water rights within a drainage. A substantial number of use rights for water exist (over 70 percent in the Powder River basin, for example) where there is no record of quantification of those rights (p. 16).

H I G H L I G H T S

☆ The identification and quantification of all existing federal, Indian and individual water rights in Montana is necessary so that proper decisions can be made regarding permits and water reservations (p. 16).

☆ There is a general lack of stream flow data (especially in eastern Montana) where new appropriations are occurring (p. 16).

☆ As water becomes scarce and competition for its use increases, problems will become more acute and applications more complex. Additional professional and analytical staff is necessary to minimize processing times. Professional review and analysis by agricultural engineers, geohydrologists, soil scientists, and others are required for the proper evaluation of applications (p. 16).

☆ The ownership and quantification of pre-1973 water rights to be changed, transferred or sold is an acute problem. People either are not aware that the law exists or they fail to comply with the law for changes and sale of water rights (p. 17).

☆ A considerable amount of time was expended preparing an environmental impact statement and processing 35 applications for reservation of water in the Yellowstone River basin. Depending on the success of the reservation process for the Yellowstone, numerous applications for reservation will probably be submitted from other basins of the state (p. 18).

☆ Additional applications for water reservations will mean increased processing times for other pending applications for permit and a decrease in the state water planning efforts because of the diversion of the limited staff (p. 18).

☆ A controlled ground water area has been established south of Glendive to control water injection for oil recovery in oil fields and to protect the rights of existing ground water users (p. 18).

☆ Approximately 20,000 Certificates of Water Right, Notices of Completion, Provisional Permits, pending applications for Water Use Permit, pending and approved applications for change of an Appropriation Water Right and Sever and Sales have been microfilmed and computerized (p. 18).

☆ Records of water use and aerial photos used to compile County Water Resources Surveys are being microfilmed to preserve the records for use in the adjudication of water rights and administration of the Water Use Act (p. 18).

☆ In October 1973 the Water Rights Bureau initiated the adjudication of the existing water rights in the 4,000 square mile Powder River basin (p. 22).

☆ By July 1980, all data is expected to be collected and compiled for the Powder River basin. Shortly thereafter a preliminary decree can be issued by the Sixteenth District Court (p. 22).

☆ Based upon progress made in the Powder River basin, it is estimated that completion of the work to the preliminary decree stage in the entire Yellowstone River basin will cost an estimated \$10 million and take about 60 years at the current funding rate of \$180,000 per year (p. 22).

☆ Data collection and compilation in the Powder River basin is a long and laborious process. It is necessary, however, because most claimants are not familiar with water right law and have only a limited knowledge of how to quantify their water rights (p. 25).

☆ Under the current statute the only way to accelerate the adjudication of water rights, especially in areas of many disputes, is to increase funding for the program. At a time when there is limited general fund money available, an evaluation of existing funded programs must be made to determine priorities (p. 25).

☆ Orders for declarations of water rights in the Tongue and Bighorn river basins have been held pending because of litigation in federal court concerning jurisdiction over Indian and federal water rights (p. 25).

CHAPTER 3 WATER CONSERVATION PROJECTS

☆ Because of deterioration with age, design deficiencies during construction and insufficient or incorrect maintenance and repair, many water conservation projects now require substantial, expensive rehabilitation. Some state-owned dams pose an unacceptably high danger to people living below them. A few projects have deteriorated so seriously that the water users associations may be forced to endure extreme financial burdens to keep the projects functional (p. 27).

☆ The spillway of Cooney Dam of the Rock Creek Project must be replaced, as must the spillways of Tongue River and Nevada Creek dams. Spillways of several other project dams need repair or replacement. As the owner, the state has a tremendous potential liability should one of the deteriorated projects fail and cause property damage or death (p. 27).

☆ The cost to a water users association of one million dollars of liability insurance coverage ranges from \$400 to \$800 per project. A one million dollar insurance policy is likely to be inadequate if a dam should fail. Insurance is simply not an adequate substitute for a reasonably safe dam (p. 30).

☆ The department is attempting to rehabilitate projects in immediate need of repair and to divest itself of any property interest in projects where future state involvement is not desirable (p. 30).

☆ The condition of the Tongue River Dam spillway is probably the most serious problem on all of the projects. The spillway is in poor condition and is too small to handle a large flood without causing the dam to fail. Failure of the dam could cause millions of dollars worth of damage in addition to the loss of the reservoir and the benefits it provides (p. 32).

☆ Because of the growing energy crisis, the relative low cost of installation of electrical generation equipment on existing dams and the environmental advantage of hydroelectric generation compared to coal-fired electric generation, the department believes that there is a ready market for hydro-electricity generated on existing state-owned dams (p. 34).

☆ Proceeds from sale of hydroelectric power generated on state-owned projects should be used for the repair of existing projects and the design and construction of new projects (p. 34).

☆ DNRC has selected three projects for hydroelectric studies: Painted Rocks on the West Fork Bitterroot River, Broadwater Dam on the Missouri River and Deadman's Basin, an off-stream storage dam near the Musselshell River. A computer program simulating the seasonal flow characteristics of the watershed and operation of the plants was used to perform energy studies. The three projects combined indicated a potential annual generation of 105 million kilowatt-hours having an estimated market value in excess of \$2.7 million annually. This energy is equivalent to that produced by approximately 60,000 tons of coal in a modern coal-fired electric generating station (p. 34).

☆ Progress toward rehabilitation of state-owned water conservation projects has been slow. The department staff assigned to this task is too small, and the amount of funds available to loan for rehabilitation is extremely limited. Four engineers and two technicians from the Engineering Bureau are not a sufficient staff to respond to emergency situations as they arise. Anticipated problems often cannot be solved before they become emergencies (p. 36).

CHAPTER 4 DAM SAFETY

☆ State-owned dams have been inspected regularly for the past several years by a dam safety engineer employed by DNRC. Unfortunately, these inspections are not thorough enough to find all potential problems. Studies are needed to determine whether spillways are large enough and whether dam stability is within acceptable limits (p. 37).

☆ Due to an increase in inspections of non-state-owned dams and the need to use the DNRC dam inspector as a construction inspector during repairs resulting from dam inspections, DNRC's ability to inspect its dams has been reduced. As a result, the department has not been able to maintain annual inspections of all of its dams (p. 37).

☆ Based on a 1973 inventory of dams conducted by DNRC, 103 non-federal dams in Montana are located so that their failure could cause loss of life. The inventory enumerated some 1,700 dams and listed pertinent data for each one. This inventory probably lists only about one-half of the dams in the state that are at least 25 feet high or can store at least 50 acre-feet (p. 37).

☆ In 1978, DNRC began an inspection program which will eventually produce a report on all dams in the state which pose a significant threat to life or property due to the location of the dam. These reports will identify further investigations or repairs that may be needed (p. 37).

CHAPTER 5 FLOOD PLAIN MANAGEMENT

☆ With assistance from the Flood Plain Management Program, 24 communities became eligible for the National Flood Insurance Program during the past year. As of June 30, 1978, 88 Montana cities and counties were participating in the program. Department enforcement of flood plain regulations continued in Cascade County and Ravalli County began a program to regulate flood plain management locally (p. 40).

☆ To date about 1,200 stream miles have been established as designated flood plains by the Board of Natural Resources and Conservation. Local flood plain regulations have been adopted in almost all of these areas (p. 40).

CHAPTER 6 RESEARCH ACTIVITIES

☆ Many scientific uncertainties still exist concerning the predictability and effectiveness of cloud seeding as well as its impacts on agriculture and on natural ecosystems (p. 45).

H I G H L I G H T S

☆ High Plains Experiment (HIPLEX) research efforts being carried out or completed by DNRC include:

- (1) Studies of the rainfall climatology of eastern Montana.
- (2) Designing a very sophisticated network of weather stations in eastern Montana to learn what triggers thunderstorms and how they work.
- (3) Completion of a study determining the effects of 38 years (1938-1976) of variations of precipitation and temperature on the native range vegetation, specifically forage production in eastern Montana (p. 46).

☆ The HIPLEX research effort is just beginning to provide important information on how summer thunderstorms work and on the potential for seeding these storms to increase rainfall over eastern Montana. In addition, state HIPLEX biologists are ascertaining the impacts and benefits that additional rainfall will have on agriculture and the native rangeland ecosystems (p. 48).

☆ The department is involved in a series of cooperative demonstration projects with the National Aeronautic and Space Administration (NASA). During this one-time study, cooperative efforts are being carried out by scientists from within several state agencies, state universities and Cascade County. The goal of this demonstration project is an evaluation of LANDSAT satellite and high altitude remote sensing technologies in the measurement of the natural resources of Montana; technological effectiveness as well as costs will be weighed. Many agencies might make use of the techniques; therefore, the potential savings are considerable (p. 48).

CHAPTER 7 WATER RESOURCE DEVELOPMENT

☆ With future water shortages anticipated, the Technical Assistance Program (TAP) to Water Resources Projects is important in the development of the water resources of this state. Numerous streams and rivers are already over-appropriated, leaving only flood flows which must be stored, available for appropriation. This program may be the initial step in the development of a future water project, and will be even more useful as the demand for water increases (p. 51).

☆ Both water conservation and water storage will be of utmost importance as supplies are depleted. TAP can have a significant impact on future water use by making it possible for local groups to select the most feasible solution prior to becoming financially obligated to a project (p. 51).

☆ The effect of the Renewable Resource Development Program (RRD) has been favorable to water resource management in Montana. Funding was granted last session for the conversion of 5,800 acres from ditch and electrical sprinkler irrigation to a gravity sprinkler system. This not only resulted in electricity savings, but also in the amount of irrigation water used (p. 52).

CHAPTER 8 WEATHER MODIFICATION

☆ Persons desiring to undertake weather modification activities in Montana must demonstrate competence in the field of meteorology and secure a yearly license from the Board of Natural Resources and Conservation. A licensee can undertake specific weather modification projects only upon the receipt of a permit from the board, in addition to the license (p. 53).

☆ During 1977-78, weather modification licenses and permits were issued to Colorado International Corporation as a part of the HIPLEX program and to the North Dakota Weather Modification Board (p. 53).

H I G H L I G H T S

WATER PLANNING

The Water Resources Division is responsible for preparing the State Water Plan. This plan is meant to establish a program for the conservation, development and utilization of Montana's water resources and to propose the most effective means by which these water resources may be applied for the benefit of Montanans. The main objective is to guide the use of water resources within the state.

Governor Judge recently made this statement about Montana's water:

Water is the liquid pillar supporting our economy, the priceless, previous foundation of our style and quality of life. Water—its availability, allocation and management—will shape Montana's future just as certainly as it shaped our past. . . .

In the last decade, and particularly during the last few years, intense and frequently contradictory demands are being placed on our water resources.

It is clear that our state cannot afford either the luxury of inertia or the risk of complacency concerning water matters.

Montana must be able to control its own water-use destiny in an era that has seen increased water resource awareness and conflict. The following issues must be successfully addressed if we are to guarantee that water will always be available for the benefit of Montanas:

- Planning, authorization and development of Federal water projects.
- Federal claims to reserved water rights.
- Designation of National Wild and Scenic Rivers.
- Formulation of a Federal water policy.
- Indian claims to reserved water rights.
- Water treaties between Canada and the United States.
- Water compacts between Montana and other states.
- Adjudication of existing water rights.
- Establishment of water quality standards for Montana streams.
- Adoption of instream flows for Montana streams.
- Water requirements for emerging coal-related energy development.
- Water requirements for increasing agriculture development.

Montana, through enactment of the Water Resources Act of 1967, has attempted to respond to these issues. The water planning program has compiled water resources and use information, participated in cooperative water planning efforts, generated guidelines for water development and participated in water reservation proceedings. In addition, the program has ensured that Montana's interests are represented in interstate compact negotiations, international water apportionment activities, national water policy and interstate water resource programs and projects. The program has projected future water requirements, formulated plans and alternatives, identified water storage needs and recommended methods of implementation of water resources programs and projects.

MONTANA'S WATER AND ITS USE

The task of preparing and implementing plans to effectively guide water resource development in Montana is complex and difficult. Montana has an area of over 147,000 square miles and includes three major river drainage basins: The Clark Fork of the Columbia, the Missouri and the Yellowstone (figure 1-1). Of the 43,899,580 acre-feet of water that flows out of Montana each year, 28,465,950 acre-feet originate in Montana. Sixty-seven reservoirs with a capacity of 5,000 acre-feet or more (total capacity-38,533,000 acre-feet) have been developed to capture these flows so they can be used at a later, more advantageous time. About 12,975,000 acre-feet of water per year are diverted from Montana streams for irrigation, municipal, industrial and livestock use with almost 5,990,000 acre-feet being consumed. Well over 90 percent of the water diverted and consumed is for irrigation use on 2,424,900 acres.

Water remaining in the streams is also valuable. Four rivers in Montana have received designation under the federal Wild and Scenic Rivers Act. In ad-

dition, eight rivers, totaling 452 miles, have been classified as having national significance.

Planning is further complicated by the many individuals, organizations and agencies developing or preserving water resources. Individuals, municipalities, industry, irrigation districts, water users associations, conservation districts, state agencies, the Soil Conservation Service, U.S. Bureau of Reclamation, U.S. Corps of Engineers, Indian tribes and others have interests in preserving or utilizing the state's water.

The federal government has developed storage projects (e.g., Canyon Ferry and Ft. Peck reservoirs) that control large amounts of water and plans to reserve additional water under the authority of the National Wild and Scenic Rivers Act. Indian tribes claim large amounts of water on and adjacent to their reservations. The overlapping authorities and jurisdictions of these interests represent institutional constraints in the formulation and implementation of a comprehensive state water plan.

PLANNING PROCEDURE

The planning process consists of: (1) inventory, (2) plan formulation and (3) implementation. Descriptions of these three general phases follow along with a progress report on the State Water Plan.

PHASE ONE: INVENTORY

The first phase of the State Water Plan is a resource inventory. This inventory is a detailed accumulation of knowledge about water and related land resources within the state, their present management and use. Twelve inventory series

reports containing information acquired during the study have been published. They are:

1. *Directory of State of Montana Federal Agencies and Private Groups Active in the General Field of Water Resources*, revised in 1971.
2. *Water Resources Program Conducted by Government Agencies in Montana*, 1969.
3. *Montana Register of Dams*, 1968.
4. *Montana Water Resources Board, Water Resources and Planning*, 1968.

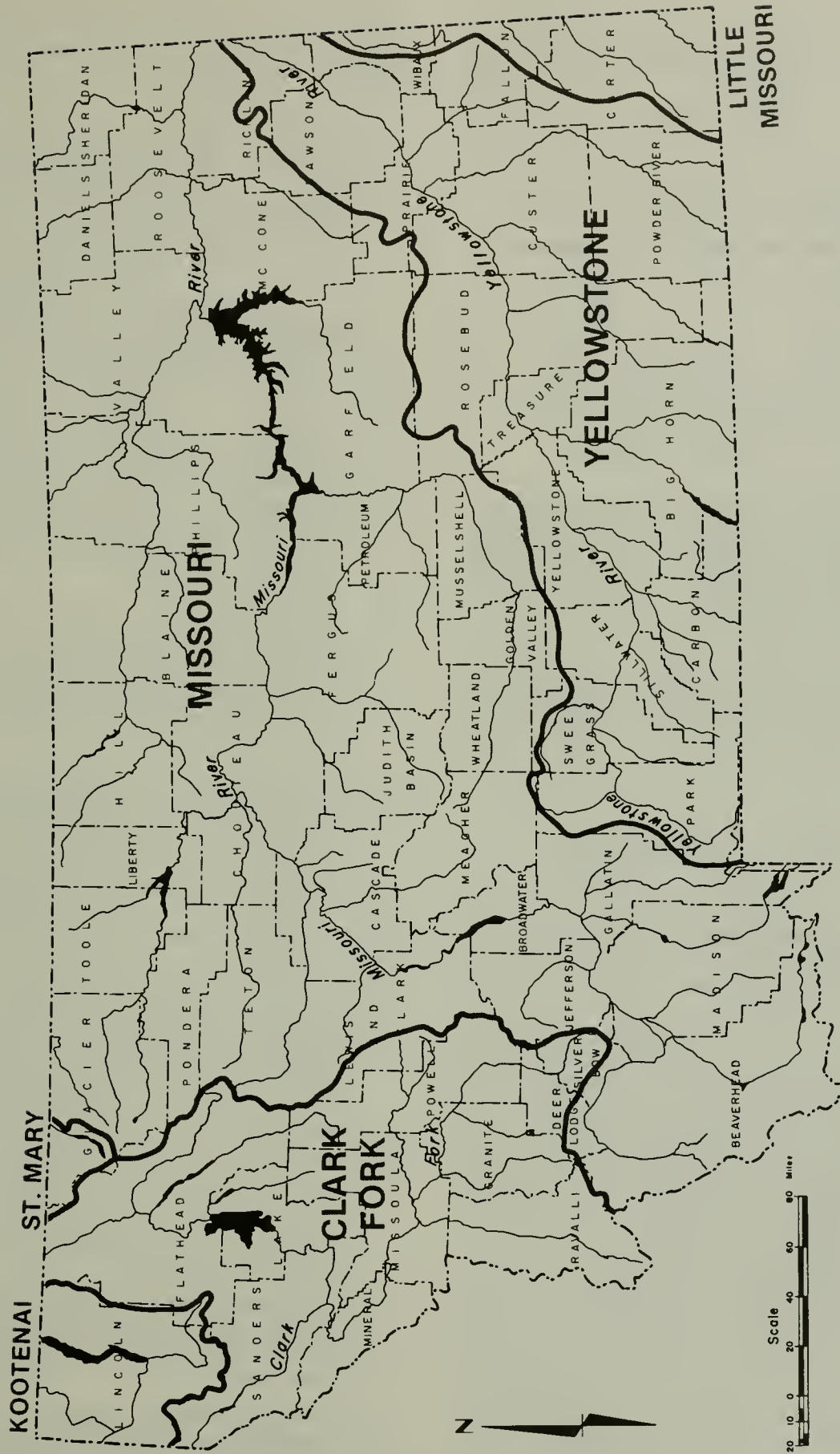


FIGURE 1-1 MAJOR DRAINAGE BASINS OF MONTANA

5. *Montana Water Law, the Resume*, 1968.
6. *Catalog of Stream Gaging Stations in Montana*, revised 1972.
9. *Summary of Potential Projects in Montana*, 1969.
10. *The Bibliography of Montana Resources and Related Publications*, 1968.
11. *An Atlas of Water Resources in Montana by Hydrologic Basin*, 1970
12. *A Progress Report, July 1, 1967 - July 31, 1970*.
13. *Water Use in Montana, Comprehensive Water and Related Land Resources Planned for the State of Montana*, 1975.
16. *Groundwater in Montana*, 1970

Also involved in this phase is the computerization of published and unpublished data. When needed for subsequent phases of water planning, retrieval of water and related land resource information will be easier and faster.

★ Inventory reports will continue to be published and updated as new and better information is gathered, as the need for specific information arises and as the expertise becomes available to do necessary studies.

PHASE TWO: PLAN FORMULATION

Phase two involves development and publication of alternative plans, programs and projects to be implemented in each of two time periods: between the present and 2000, and between 2000 and 2020.

Findings of the inventory and planning phases will determine development selection. Findings of other regional, state, basin and county planning efforts, including special studies and resource reviews conducted by the Water Resources Division will be included in the decision-making process. Public and agency comment will also be used in determining the final water plan recommended to the Board of Natural Resources and Conservation for adoption.

The Water Resources Division, in order to formulate the State Water Plan, has set guidelines to determine the nature of investigations to be accomplished. To a large extent these guidelines will influence the outcome of the study. They reflect important public policy and, by directing planners, eliminate wasted time in unacceptable planning ef-

forts. It is important that these guidelines be understood and accepted by everyone involved with the State Water Plan:

1. The State Water Plan will serve the general welfare of the people of Montana by striving toward a balance of economic efficiency (considering such factors as marketing potential and national production allocations), resource development (at regional levels, as well as individual project levels) and environmental quality (the environmental effects of development weighed against the benefits of nondevelopment).
2. The plan will describe alternatives formulated to meet the need for goods, services and benefits derived from water and related land resources. Recommendations for management of these resources will be made. Information on each alternative will be presented by subbasin and, where applicable, by county.
3. The importance of people's needs and desires will be recognized. Public involvement will be encouraged throughout the entire planning process and the public's response to each management alternative will be evaluated.
4. The plan will give priority to in-basin use of water resources. That is, water needs within the basin will be met to a reasonable degree before water transfers to other basins are considered. Montana's interests in water use will receive priority even though federal and regional interests will also be recognized.
5. The plan will consider the flexibility of state and federal laws, policies and institutional relationships governing both short- and long-range water planning and development. If necessary, changes will be recommended in the laws, policies and relationships to allow development of selected alternatives.
6. The plan will be formulated utilizing only water rightly available for Montana's uses. Full consideration will be given to all interstate agreements and existing water rights within Montana.
7. Other planning efforts will be evaluated to determine the impact of other alternative uses of Montana's water and related land resources.
8. Due to anticipated rapid changes in social, economic, environmental, technological and

physical factors, the State Water Plan will be formulated so that it provides a flexible guide for water and related land resources planning in Montana now and well into the future. The plan will serve needs which may vary widely from those anticipated or being considered at the present time. Portions of the plan which are not implemented or become out-of-date will be reviewed and revised to meet the water planning objectives.

River Basin Studies

Early in the planning process, it was decided to divide the state into river basin planning units to facilitate study of the resources and their relationships. The major basins in the state are the drainages of the Clark Fork of the Columbia, the Missouri River, and the Yellowstone River, each considered a planning area (figure 1-1). This approach, called the watershed planning approach, must be flexible and allow for the study of larger and smaller problem areas as the need arises.

Smaller river basin studies will be prepared in an attempt to resolve the short-range problems identified by the *Framework Report* and to identify foreseeable long-range problems, develop solutions for them and make recommendations for solving these problems.

★ Completion of the river basin studies will fulfill, in part, the plan formulation phase of the water planning process.

Columbia River Basin. The only water plan developed and adopted by the Board of Natural Resources and Conservation is for the Flathead River Basin. The plan, a product of a three year Level B study conducted under the auspices of the Pacific Northwest River Basin Commission, was designed to resolve complex, long-range problems and was prepared by a team of federal agencies, state agencies and private groups.

Some examples of recommended actions in the plan are:

1. Improve Ashley Creek quality.
2. Stabilize Whitefish Lake.
3. Study the feasibility of constructing Buffalo Rapids 2 and 4 hydropower facilities.
4. Establish minimum stream flows and lake levels.

The Clark Fork of the Columbia River Basin Cooperative Study, prepared in cooperation with the

U.S. Department of Agriculture, was completed in late 1977. This study identified water and related land resource problems, potential projects, ongoing programs that need modification and new program potentials. It also assessed the capabilities and limitations of the natural resources within the basin. Examples of recommended action in the report are:

1. Store 28,000 acre-feet of excess spring runoff water in three reservoirs and two lakes for late-season irrigation of presently irrigated land.
2. Improve the municipal water systems of 20 towns through improved water quality, supply and distribution systems.
3. Reserve minimum streamflows for 2,484 miles of live streams.

Yellowstone River Basin. The *Yellowstone River Basin and Adjacent Coal Area Level B Study* was conducted by the Missouri River Basin Commission. State and federal agencies completed a reconnaissance level evaluation of water and related land resources in the basin. The report includes recommendations for implementation of projects subject to the satisfactory completion of detailed feasibility studies. Examples of this study's recommendations are:

1. Irrigation of the White Horse Bench Unit.
2. Improvement of flow regimen in tributary streams above Livingston.
3. Installation of a six megawatt Tongue River Reservoir power plant.

★ The results of this study, along with the Board of Natural Resources and Conservation's decision on water reservation applications and public involvement, will be used to formulate the water plan in this basin.

Missouri River Basin. The Missouri River Basin Level B Study is currently underway in Montana's portion of the Missouri River basin. Its purpose is to identify potential water resources projects and programs and to recommend a course of action for water use that is in the best interest of Montanans. The study is being conducted under the auspices of the Missouri River Basin Commission. One of the major portions of the study is designed to determine the availability of water for future use throughout the basin.

Special Studies

Special studies generally address specific issues or problems, are restricted to a small area and

are not comprehensive in scope. They are prepared in response to critical need, controversies, legislative directives or federal requests, and provide input to the planning phase of the State Water Plan. Some of the special studies undertaken by the Water Resources Division are discussed below.

Clark Fork of the Yellowstone Sedimentation Study. The 42nd Montana Legislative Assembly requested a study of the problem of suspended sediment from poor water use practices in the Clarks Fork of the Yellowstone River. An interagency study committee was formed to examine numerous aspects of the problem. Improved land use practices were recommended to help solve the erosion and sediment problems; however, it was concluded that in some cases even the most intensive land management practices would not correct the problems.

Supplemental Water for the Milk River. A study of the possibilities for diversion of water to the Milk River was directed by the 1975 legislature.

The study, a cooperative effort by the Water Resources Division and the Bureau of Reclamation, indicated a need for a supplemental flow in the Milk River and identified and analyzed four alternatives to supply extra water to the river.

Upper Flathead River Basin Study. In 1975, House Bill 622 delegated to DNRC the responsibility for conducting a study of the upper portion of the Flathead River basin and the northern portion of Flathead Lake. Concern for the possible impacts in Montana from coal development directly upstream in Canada prompted the legislation. Results of the study indicated that Canadian coal development could adversely affect water quality and fish and wildlife habitat in Montana and change the form of the river channel downstream. Study recommendations have been implemented in part by federal funding of further studies in the basin and by discussions between the Governor of Montana and the Premier of British Columbia.

Yellowstone Impact Study. The *Yellowstone Impact Study*, conducted by the Water Resources Division and financed by the Old West Regional Commission, was designed to evaluate the potential physical, biological and water use impacts of water withdrawals and water development on the middle and lower reaches of the Yellowstone River basin in Montana.

The study was to project three possible levels of future agricultural, industrial and municipal development in the Yellowstone basin and the streamflow

depletions associated with such development. Impacts on river morphology and water quality were then assessed. Finally, the impacts of altered streamflow, morphology and water quality on such factors as migratory birds, furbearers, recreation and existing water users were analyzed.

The study began in the fall of 1974. By its conclusion in December of 1976, the information generated by the study had already been used for a number of moratorium-related projects such as the environmental impact statement for water reservations in the Yellowstone River basin. A final report summarized all aspects of the study in eleven specialized technical reports:

1. *Future Development Projections and Hydrologic Modeling in the Yellowstone River Basin, Montana.*
2. *The Effect of Altered Streamflow on the Hydrology and Geomorphology of the Yellowstone River Basin, Montana.*
3. *The Effect of Altered Streamflow on the Water Quality of the Yellowstone River Basin, Montana.*
4. *The Adequacy of Montana's Regulatory Framework for Water Quality Control.*
5. *Aquatic Invertebrates of the Yellowstone River Basin, Montana.*
6. *The Effect of Altered Streamflow on Furbearing Mammals of the Yellowstone River Basin, Montana.*
7. *The Effect of Altered Streamflow on Migratory Birds of the Yellowstone River Basin, Montana.*
8. *The Effect of Altered Streamflow on Fish of the Yellowstone and Tongue Rivers, Montana.*
9. *The Effect of Altered Streamflow on Existing Municipal and Agricultural Users of the Yellowstone River Basin, Montana.*
10. *The Effect of Altered Streamflow on Water-Based Recreation in the Yellowstone River Basin, Montana.*
11. *The Economics of Altered Streamflow in the Yellowstone River Basin, Montana.*

Clark Fork of the Columbia Hydropower Study. This study anticipated that large and numerous water reservation applications may be made in the Clark Fork of the Columbia River. To prepare for analysis of these applications the Water Resources Division

contracted with a private firm to evaluate what effect water development or preservation would have on hydropower facilities on the Clark Fork. The study is not yet finished.

Water Supply for Emerging Coal Technologies. The Missouri River Basin Commission has contracted with the Water Resources Division to provide input for a study designed to assess the water supply availability for development of coal technologies in the Yellowstone basin. The division has provided information regarding the probable location of emerging coal technology facilities in Montana and their associated water use.

Montana Water Supply and Demand. The Water Resources Division provided an analysis of water supply and demand trends, projections and the potential effect of future water use on Montana's economic future. The report concluded that:

1. Most existing studies of water use in Montana do not include an adequate hydrologic analysis of the respective study areas.
2. Sufficient water will be available for city growth.
3. Several regions of the Missouri and Yellowstone River basins do not have adequate water to supply all projected demands.
4. Water quality problems are present in several regions throughout Montana, attributable to both human practices and natural phenomena.
5. Instream reservation, Indian water rights, hydropower water rights, unadjudicated valid water rights throughout Montana, Canadian and Wyoming and apportionments of inflows in to Montana all contribute to a large amount of uncertainty concerning the question of how much water is available in Montana's streams for future use.
6. Demands for all uses of water, instream and consumptive, are increasing.
7. The major competition for water use in the state is between instream and consumptive uses, but instream uses such as maintenance of fisheries and riparian habitats, water quality control and hydroelectric power generation, are effectively complementary to one another. Consumptive uses such as irrigation, non-energy industrial use and energy production, are competitive with one another and with instream uses.

The above mentioned studies indicate that unappropriated water is probably available for additional consumptive uses and that additional streamflow depletions are expected to occur.

Missouri River Basin Irrigation Study. The Water Resources Division, in cooperation with the U.S. Soil Conservation Service, is identifying the potential for development of irrigable lands in the Missouri River basin. The opportunity for both private and project development will be analyzed based on water availability and economic feasibility. The result of the study should be available in the spring of 1979.

Libby Reregulation Dam. Northwestern Montana residents have expressed concern over the present operation of outflows from Libby Dam, and opposition to the proposed addition of four generating units and a reregulating facility. Governor Judge, Lieutenant Governor Schwinden, Senator Hatfield, and Senator Baucus have received numerous requests to initiate a reevaluation of present operating criteria for Libby Dam and to reconsider the state's position with regard to the proposed project. The Water Resources Division has led an effort to analyze relevant issues and recommend a position on the project to Governor Judge.

Water Development in the Tongue and Powder River Basins. A report has been submitted to the legislature discussing the possibility of conducting joint water studies with Wyoming and the Crow and Northern Cheyenne Indian tribes to analyze water marketing potential and to evaluate the effect water development might have on water quality within the Tongue and Powder river basins.

Water Storage in the Big Hole River Basin. The 45th Legislative Assembly in 1972 passed House Joint Resolution No. 80 requesting DNRC to study the feasibility of off-stream storage in the upper Big Hole River basin. Consequently, the Water Resources Division has submitted a report to the legislature which identifies numerous potential reservoir sites in the basin and evaluates the feasibility of each site for development.

Resource Reviews. Water resource reviews examine water-related information and issues for a basin, and are valuable for planning the development or preservation of water resources. Resource reviews completed by the Water Resources Division are summarized below.

Yellowstone River Basin Water Resources Situation Report and The Future of the Yellowstone River. . . ? These two reports, published in 1975 and

1977 respectively, presented a discussion of issues concerning the Yellowstone River. The reports were written to answer requests from the Montana Legislature to provide information on conflicts in the use of Yellowstone River basin water and the water reservation process that was being initiated in that basin.

Madison River Basin—A Resource Review. The Madison River resources review study by the Water Resources Division gathered basin information for project oriented feasibility studies.

PHASE THREE: IMPLEMENTATION

The third phase of the state water plan is the implementation of recommended plans, programs and projects. Some implementation will take place concurrently with present planning efforts and some will be the result of future detailed surveys of problem areas. However, Montana water law does not mandate the implementation of water plan recommendations.

Other parts of the implementation phase are: 1) water allocation responsibilities which may lead directly to water use decisions in-state or water sharing with neighboring states and counties, 2) interstate and regional coordination activities which result in cooperative water planning efforts and represent Montana in national legislation and 3) water marketing which leads directly to the use of stored water.

Water Allocation

Water allocation activities include water reservation efforts and interstate and international water apportionment studies.

Water Reservations. Under the 1973 Montana Water Use Act, state and federal agencies, as well as political subdivisions of the state, may apply to the Board of Natural Resources and Conservation to reserve water for existing or future beneficial uses, to maintain a minimum flow level or to maintain water quality. The Yellowstone Moratorium, enacted in 1974, suspended for three years all water use permit applications for diversions of over 20 cubic feet per second or storage of over 14,000 acre-feet in the Yellowstone River basin. For a number of reasons the moratorium was extended through December 31, 1978.

The department applied for sufficient water in the Tongue River to fully develop Montana's share of the water in that stream. The application showed

that the state intended to increase reservoir storage on the Tongue River to provide water for a number of beneficial uses.

The Water Resources Division prepared the draft, final and draft addendum environmental impact statement for these applications. The division participated in hearings on each application held for the board. The division helped to prepare proposed findings on each of the water reservation applications. The findings assisted the board to understand how each reservation could fit into the water reservation pattern.

Interstate and International Water Apportionment.

Yellowstone River Compact. Montana, North Dakota and Wyoming are members to the Yellowstone River Compact ratified in December 1950. This compact provides for the allocation and appropriation of water from the major interstate tributaries to the Yellowstone River.

Anticipation of increased industrial and agricultural water use in both Wyoming and Montana has recently indicated a need to seriously discuss implementation with Wyoming, and an interstate committee has been formed to unravel the complex issues of the compact. The committee's duty is to provide a practical means of day-to-day operation of the compact, and to estimate, in each of the four tributaries, how much water is available to both states.

Poplar River. The Poplar River Task Force on Apportionment was established by the International Souris-Red Rivers Engineering Board in April 1975. Water Resources Division personnel were deeply involved in this task force. The International Joint Commission (IJC) report to the governments of the United States and Canada essentially adopted the Task Force report on the following subjects:

- An equitable apportionment of the flows of the Poplar River basin at the international boundary;
- A method of calculating natural flows of the Poplar River basin at the international boundary; and
- The membership and terms of reference for an international group to administer an apportionment agreement.

The recommendation was made with the provision that it could be changed on the basis of water quality impacts. The two federal governments have referred water quality impact questions to the IJC for study.

The Water Resources Division now works with the IJC-created International Poplar River Water Quality Board and its committees.

Similar proceedings have also been initiated for Big Muddy Creek, an international stream just east of the Poplar River.

The International Souris-Red Rivers Engineering Board of the IJC is in the process of establishing a task force to study and recommend to IJC an apportionment of the flows of Beaver Creek, Big Muddy Creek and the tributaries of both streams that cross the International Boundary. Both countries are interested in developing water in Beaver Creek; the most immediate proposed use concerns development of potash reserves in Montana.

Missouri River. There is no compact in effect between Montana and downstream states regarding the Missouri River, although there has been considerable discussion about the need for a compact to govern water use between Missouri River basin states. While states downstream from Montana are initiating these discussions the Water Resources Division recognize its responsibility to protect Montana's water use now and in the future.

Columbia River. Under the terms of the Columbia River Treaty between Canada and the United States, Canada is permitted, after September 1984, to divert up to 1.5 million acre-feet of water annually from the Kootenai River to the Columbia River near Canal Flats, Canada. Diversion of the full treaty entitlement would result in a net energy gain to British Columbia of up to 870 million kilowatt-hours (kwh) per year, and an energy loss in the United States of about 400 million kwh per year. The operation of Libby Dam and the proposed Kootenai Falls hydropower facility in northwestern Montana would be substantially altered by such a diversion. The Water Resources Division will evaluate the effects of Canadian diversion and examine alternatives to compact allocations.

Interstate and Regional Coordination. Through the Water Resources Division and its predecessor agencies, Montana has actively supported four interstate organizations of a national or regional nature through direct participation and/or state funding in the form of dues or cost-sharing assessments.

Interstate Conference on Water Problems. The Interstate Conference on Water Problems (ICWP) was formed in 1959 as a loose coalition of state water administrators who volunteered to work with the Senate Select Committee on Water to address water

problems and issues of mutual concern. This voluntary effort resulted in congressional enactment of the Water Resources Planning Act of 1965 (P.L. 89-80), which has three major provisions:

- Title I established the Water Resources Council consisting of the secretaries and administrators of the major federal agencies with water resources responsibilities to coordinate federal water programs.
- Title II provided for River Basin Commissions, independent joint federal/state entities, to be established by the President at the request of the basin's governors.
- Title III authorized \$5 million to be awarded as planning grants to the states to formulate state water plans and participate in regional water planning activities.

In 1977, ICWP incorporated as a non-profit organization with the stated purpose of facilitating state and intrastate agencies and associations concerned with the conservation, development and administration of water and land-related resources. In the interest of the general welfare, the affiliated members may consult, study, exchange information, educate and express viewpoints in the field of water and land-related resources. Benefits to the state include consultation and information exchange; perhaps the greatest benefit is agreement on water resources issues which could be affected by federal actions.

Western States Water Council. Montana also maintains active membership in the Western States Water Council authorized by the Western Governors' Conference on June 13, 1965. The Conference recognized that the states should plan for inter-regional water utilization, alternative methods of meeting the needs of water deficient areas, and an equitable means of maintaining the security of the water rights of each state. The Conference formed the council to get cooperation among the western states in planning for integrated development of water resources by state, federal and other agencies.

The Western States Water Council has consisted of the eleven western states and has been expanded to twelve member states with the admission of Texas. The council maintains a central office in Salt Lake City, Utah; Council operations are financed by appropriations from member states. Annual contributions have ranged from a high of \$13,500 to a low of \$5,000 and are currently at \$13,000.

Through its staff and members, the council monitors federal legislation, rules, regulations and

agency activities affecting western states' water and related land resources, or the state administration of those resources. Most of the formal actions and positions taken by the council result from detailed study and recommendations by state representatives working on committees assisted by council staff. Over the past year, the council has been involved in the President's Water Policy Review, dam safety legislation, proposed amendments to the Water Resources Planning Act, Section 404 of the Water Pollution Control Act Amendments, water for western energy development, federal and Indian water rights and the 160-acre limitation on irrigation projects that use federal water. The council staff and many members participated in the Western Regional Drought Action Task Force which developed state drought plans and led the Administration and Congress to provide assistance to drought affected areas.

Pacific Northwest River Basin Commission. Under Title II of the Water Resources Planning Act the governors of Oregon, Washington, Idaho, Montana and Wyoming requested the President to establish a river basin commission to provide federal/state coordination and planning for the Columbia River basin. President Johnson, on March 6, 1966, issued Executive Order 11331 establishing the Pacific Northwest River Basins Commission (PNRBC) which consists of a chairman appointed by the President, one member from each of eight federal departments and agencies, one member from each of the five states and the chairman of the United State Entity for the Columbia River Treaty.

As mandated by the Act, the PNRBC: serves as the principal agency for the coordination of federal, state, interstate, local and nongovernmental plans for the development of water and related land resources in the basin; prepares and keeps up to date, as practicable, a comprehensive, coordinated joint plan for the basin; recommends long-range priorities for the collection and analysis of basic data for the investigation, planning and construction of projects; and undertakes studies of water and related land resource problems necessary in the preparation of the basin plan.

PNRBC operations are jointly financed by state and federal funds, originally on a 50-50 matching basis. For the past two years, the funding ratio has been 65 percent federal and 35 percent state. The states have recently asked that this be changed to 75 percent federal and 25 percent state. With the exception of Wyoming, which is assessed only \$6,000 per year because of its limited share of the basin, each of the states contributes \$30,000 per year as their state share.

As the first river basin commission established, the PNRBC led the way by developing the *Columbia North Pacific Region Comprehensive Framework Study*. Published in 1971, it compiled in 16 volumes all available information on the water and related land resources in the Columbia River basin. This study was followed by reconnaissance planning (called Level B Studies) in 12 smaller basins, including the Flathead River basin of Montana. Through Montana's participation in the PNRBC, approximately one million dollars in federal funding was allocated for federal agency participation in a Flathead River Basin Level B Study. This study has been adopted by the Board of Natural Resources and Conservation as a part of the State Water Plan.

Missouri River Basin Commission. By Executive Order 11658, on March 22, 1972, President Nixon established the Missouri River Basin Commission (MRBC) at the request of ten state governors including Montana's. Besides the chairman appointed by the President the MRBC consists of one member from each of ten federal departments and agencies, one member from each of the ten basin states and one member from each of two interstate compact commissions.

The MRBC operates under the same mandates as the PNRBC, but state shares are assessed on a formula which takes into account the area of the state which lies in the basin and the population served. Montana's share of commission operations has ranged from \$59,844 in 1972-73 to \$22,344 for fiscal year 1978.

Building on a framework report prepared by the Missouri Basin Interagency Commission in 1969, the MRBC developed the *Missouri River Basin Water Resources Plan* in 1977 and has undertaken three Level B Studies, two of which include Montana. The *Yellowstone River Basin and Adjacent Coal Area Level B Study* included parts of Montana, Wyoming and North Dakota at a total federal cost of \$1.12 million; the *Upper Missouri Level B Study* is entirely within Montana.

Besides direct federal funding of water resources planning efforts, Montana benefits through interchange of information with other western states, and by coordination of federal agencies working within the state and basin.

Water Resources Planning Act. River Basin Commission operations and federal water planning grants to states are dependent upon continued authorization and appropriations under the Water Resources Planning Act which was to terminate at the end of fiscal

year 1976. Senator Frank Church and others recognized inherent weaknesses in the Act; amendatory legislation was introduced in the last two sessions of Congress. Because of higher priority activities, Congress has simply extended the current act, which will expire September 30, 1979.

Among weaknesses cited by Congress and the states are the ineffectiveness of the Water Resources Council as it is presently constituted, and the low levels and inconsistency of planning grants to the states. Many of the weaknesses may be corrected by implementation of the President's Water Policy Initiatives announced on June 8, 1978. This policy is designed to improve planning, provide efficient management of federal water resource programs, emphasize national water conservation, enhance federal-state cooperation and improve state water resources planning. If approved by Congress this could provide, among other things, a grant program for the states to improve their water management capabilities and to develop water conservation

programs. As proposed, \$50 million would be authorized annually to the states on a 50-50 matching basis.

Water Marketing. As mentioned earlier, the federal government owns and operates reservoirs in Montana that control large volumes of water. The state and federal governments have not been able to determine how much of the water in these reservoirs belongs to the federal government. In order to use these waters without lengthy adjudication and the litigation necessary to decide precise allocations of water, DNRC has entered into a memorandum of understanding with the U.S. Bureau of Reclamation that allows the state to market up to 300,000 acre-feet of water each year from Ft. Peck Reservoir. Similar agreements have not been reached on other federal impoundments. The DNRC has negotiated with Dreyer Brothers, Inc., for sale of 32,000 acre-feet from Ft. Peck Reservoir; however, a final sub-contract has not yet been signed. Such water marketing activities are essential if Montana is to control water from federal reservoirs.

STATE WATER PLANNING EFFECTIVENESS

★ Montana has made progress towards the preparation of a State Water Plan as indicated earlier in this chapter. While the state's interests have been protected in a number of situations, the water planning staff is not sufficient to parry each thrust at Montana's water nor become deeply involved in all water resources issues. In fact, Montana's water planning staff is considerably smaller than that of most of the other western states. Water related activities have increased in recent years; Montana has tried to respond to that increase even though the water planning staff has become smaller.

★ Water planning programs have been hampered by a lack of water right information. The interim legislative water right committee's recommendation to require claim registration could materially help this situation. While the legislature has directed that a water plan be prepared, it did not mandate a means to implement such a plan. A water plan that is not implemented does not fulfill its intended purpose.

★ Some of the division's water planning efforts will lead directly to implementation; for example, Poplar River studies will lead to an allocation of water between Canada and Montana, and water reservations will lead to water allocation in the Yellowstone River basin. In addition, much of the information generated in river basin planning is valuable to those interested in irrigation, energy and hydroelectric water development. Many of the pro-

jects recommended in river basin planning are later constructed, although it is often difficult to determine exactly what role the plan played in that implementation.

★ Water is now appropriated and put to use in Montana in two very basic ways under authority of the Water Use Act. The first is by water permit. The DNRC approves or denies an application for a water permit based on the six criteria listed in the Water Use Act. The department has little discretion in its action on a water permit application. The second means of appropriating water is through a water reservation. The Board of Natural Resources and Conservation acts on reservation requests based on four criteria, one of which is public interest. This public interest criterion gives the board broad discretionary authority and an opportunity to ensure that water reservations are in the best interest of Montanans.

★ While permit appropriation offers little opportunity for implementation of water planning efforts, the water reservation process holds promise. Unfortunately, water reservation applications do not necessarily correspond to water planning activities. Water planning studies may not be prepared in sufficient detail or encompass river basins where reservation requests are received. The board is considering adopting rules that would require water planning efforts and water reservation applications to be considered concurrently in accordance with a predetermined schedule.

WATER RIGHTS

Water Rights Bureau responsibilities are specified in the Montana Water Use Act (Title 85, Chapter 2, MCA). About one-half of the employees of the Water Resources Division perform work related to administering this act. Up to 26 Comprehensive Employment and Training Act (CETA) employees were employed over the last three years to carry out necessary administrative functions and reduce the backlog of water use permit applications. The CETA program will be terminated by June 30, 1979.

WATER USE PERMITS

Water rights can no longer be acquired by posting and filing, by the mere use of water or by any other method, including adverse use, adverse possession, prescription or estoppel. Except as noted below, a person may appropriate water only by applying for and receiving from DNRC a permit to do so. The priority date of the appropriation is the date the permit application is filed with DNRC. The permit system applies to all types of proposed appropriations, including those of surface water, ground water, reservoirs, geothermal water and diffuse water. If DNRC determines that the proposed appropriation might have an adverse effect upon the rights of other persons, it is required to publish notice of the application and give direct notice to particular appropriators who might be adversely affected.

The notice of the proposed appropriation sets a date by which persons may file objections to the granting of the permit and request a hearing. If no objection is filed, DNRC may permit the appropriation as applied for or it may modify the permit upon such terms and conditions as it considers necessary to protect prior water rights or meet the criteria for issuance of a permit. If valid, timely objections are received a DNRC hearing examiner will hold a hearing pursuant to the Montana Administrative Procedure Act. Objectors and the applicant may appear to present testimony and evidence for or against the application. The permit is then either issued or denied by the department. If the permit is issued, it may have certain conditions or limitations. Appeal of

the department's order may be made to the district court. A permit can only be issued if there is water available for appropriation, there is no adverse effects to existing water rights, the proposed means of diversion or construction are adequate and other criteria as specified in the statute are met.

A flow chart (figure 2-1) graphically illustrates the process specified in the statute for processing applications for water use permits.

From July 1, 1973 to January 1, 1979, 5,150 applications for water use permits were received and a total of 4,205 provisional permits were issued by the Water Rights Bureau. On July 1, 1978, 1,212 applications were being processed. Applications have been submitted at the rate of about 1,100 per year during the last two years (figure 2-2).

Probably the greatest problem to applicants has been the time required to process applications for permit. By statute there are specific times which must be allowed for public notice, objection filing period and hearings. Other major factors which extend processing times are incomplete applications and the length of negotiation time required to mitigate the effects on existing water rights.

Through a reorganization of existing staff starting in July 1975, water rights field offices were established to serve the counties identified in Figure 2-3. Providing local assistance to applicants has greatly decreased processing times and provided

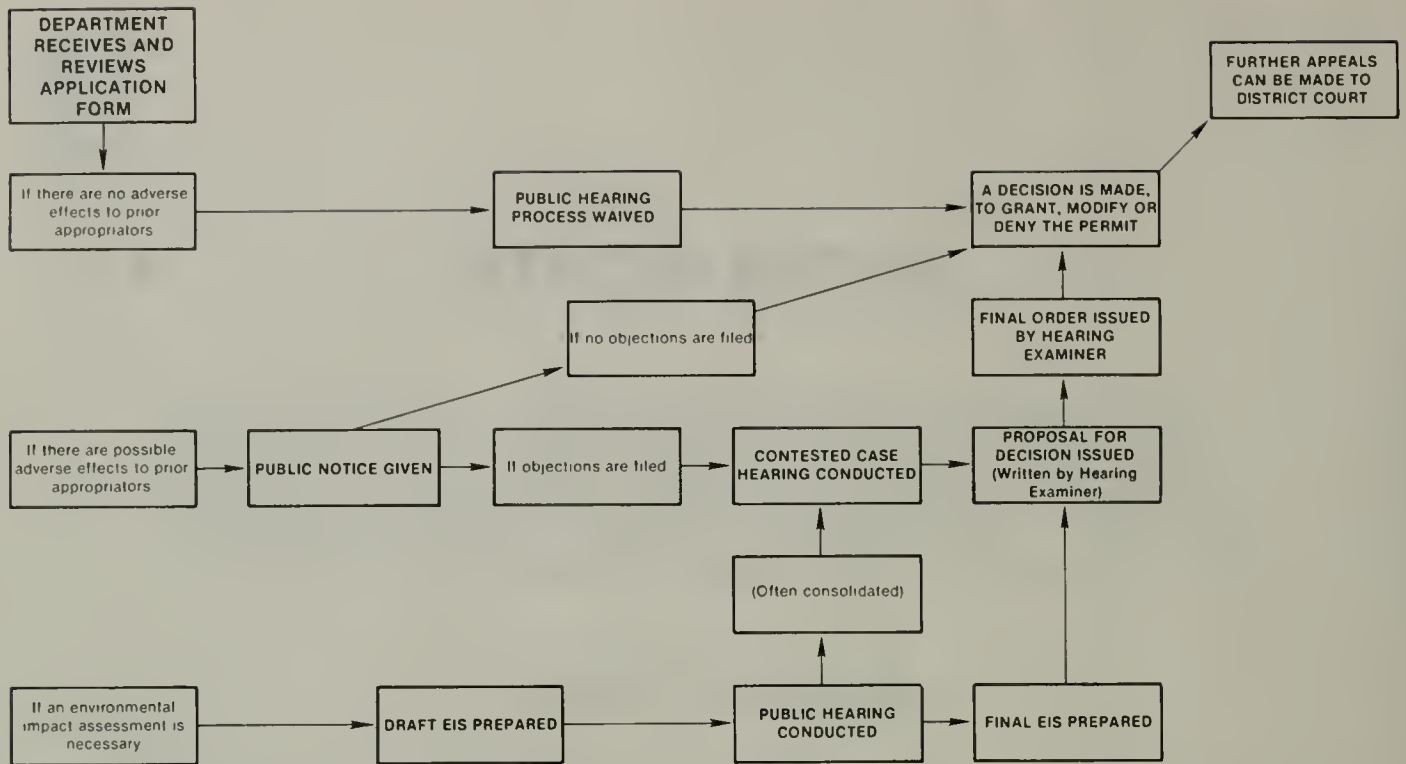


FIGURE 2-1 PROCEDURE FOR PROCESSING APPLICATIONS FOR BENEFICIAL WATER USE PERMIT

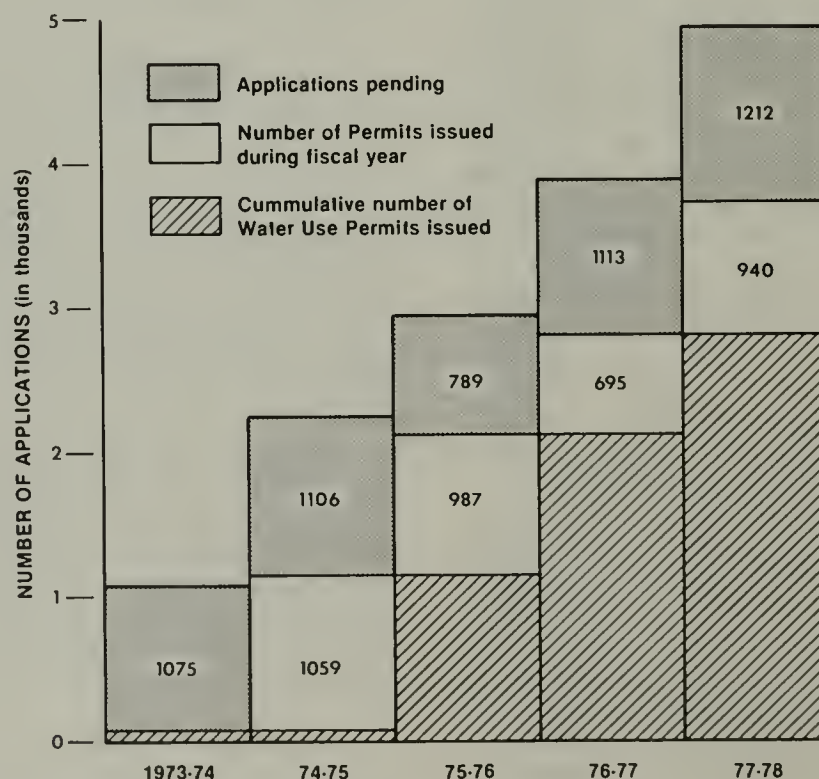
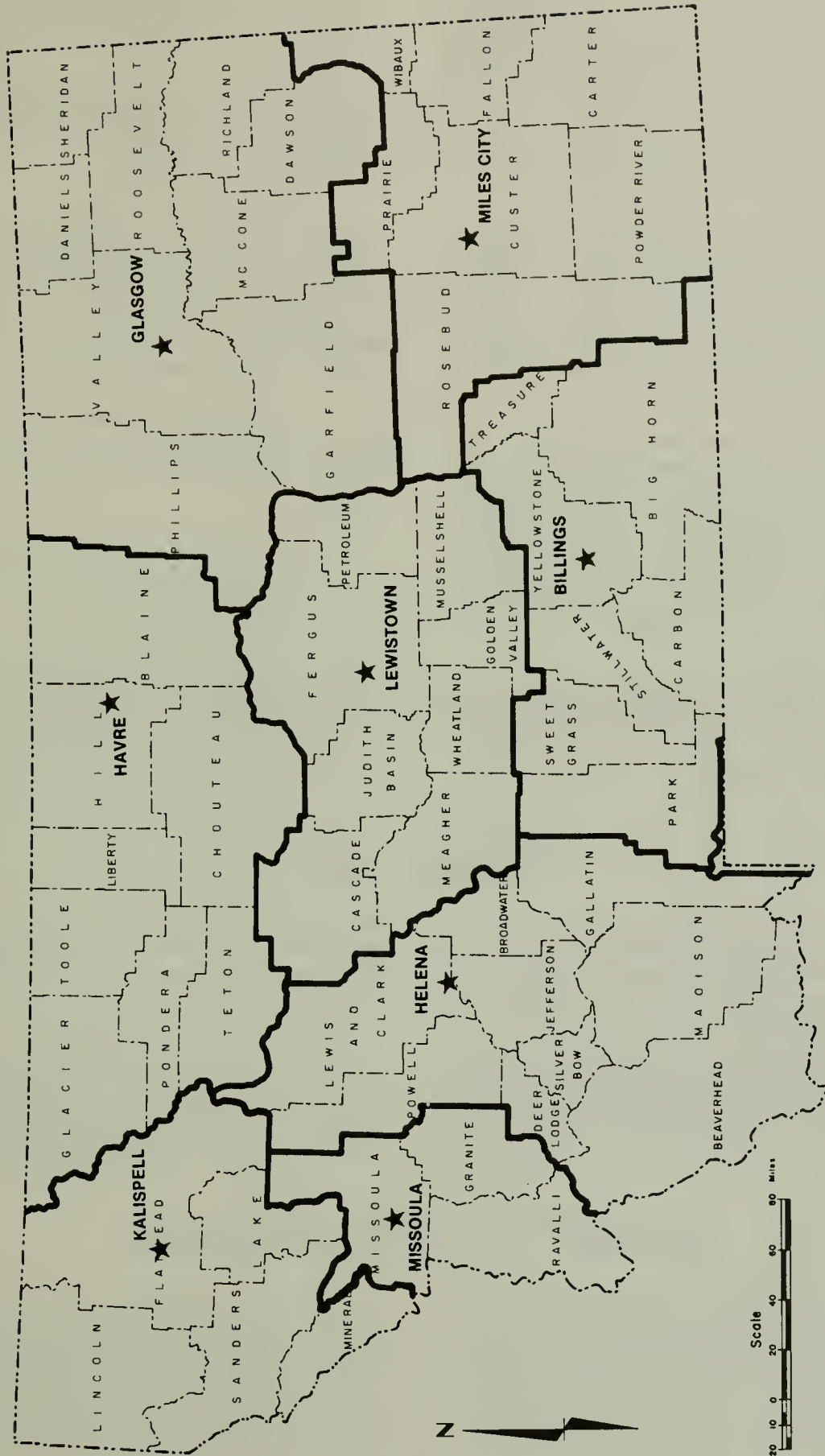


FIGURE 2-2 WATER USE APPLICATIONS AND PERMITS ISSUED



**FIGURE 2-3 LOCATION OF WATER RIGHT FIELD OFFICES AND
THE COUNTIES THEY SERVE**

better service to applicants and objectors. A statewide staff of 21 people takes care of the clerical and analytical functions of processing applications for water use permits. Thirteen of these people are in field offices. Processing time, from receipt of an application to the date the permit is issued, now averages about six months, and could be reduced by two to three months with additional staffing.

In the last fiscal year objections were received on about 300 of the 950 applications processed; about 80 progressed to the hearing stage. As water becomes more fully appropriated these hearings which cost \$1,500 to \$2,000, will increase in number and more scientific data on water flows and existing water rights will be required.

Probably the greatest single problem in administering the permit program in Montana is the lack of data needed to make a decision on whether or not a permit should be issued. There is generally a lack of information quantifying existing water rights within a drainage. A substantial number of use rights for water exist (over 70% in the Powder River basin, for example) where there is no record or quantification of those rights.

★ The identification and quantification of all existing federal, Indian and individual water rights in Montana is necessary because water planning for the future must be established so that proper deci-

sions can be made regarding permits and water reservations.

★ Flow data is quite extensive on some streams but there is a general lack of stream flow data (especially in eastern Montana) where new appropriations are occurring.

★ When the Water Rights Bureau was first organized its general responsibility was mainly clerical, with some analytical work. The bureau staff now evaluates the available flows, their effect on existing water rights and the safety of downstream water users, in an effort to protect existing water rights and use Montana's water resources wisely.

★ Proper administration of the permit system will require more staff to exercise control over permits previously issued in order to protect other water rights.

★ As water becomes scarce and competition for its use increases, problems will become more acute and applications more complex. If action is not taken to alleviate these problems even the best program for administering water rights will become ineffective. Additional professional and analytical staff is necessary to minimize processing times. Professional review and analysis by agricultural engineers, geohydrologists, soil scientists, etc., are required for the proper evaluation of applications.

GROUND WATER

For ground water appropriations of less than 100 gallons per minute, a Notice of Completion is filed upon completion of the well or developed spring and a Certificate of Water Right is issued by the Water Rights Bureau. From July 1, 1973, to January 1, 1979, 14,398 Notices of Completion were received and 10,888 Certificates of Water Right were issued. As shown in Figure 2-4, the number of notices filed has accelerated considerably to a rate of about 4,200

notices per year. With only two employees, a typist and an analyst, a maximum of 1,700 certificates per year have been issued.

In the spring of 1978 computerized typing of the certificates was initiated. Current estimates are that about 3,000 certificates per year can now be processed. However, additional staff is still necessary to keep up with the notices as they are submitted.

CHANGES, TRANSFERS AND SALES

The Water Use Act provides that an appropriator (whether under an existing water right or a new permit or certificate) may not change the place of diversion, purpose of use or place of storage without receiving prior approval from DNRC. The test for approval of such a change is whether it would adverse-

ly affect the rights of prior adjudicators or appropriators. If DNRC determines that the proposed change might have an adverse effect, the department is required to publish notice of the proposal, allow the filing of objections and provide for a hearing.

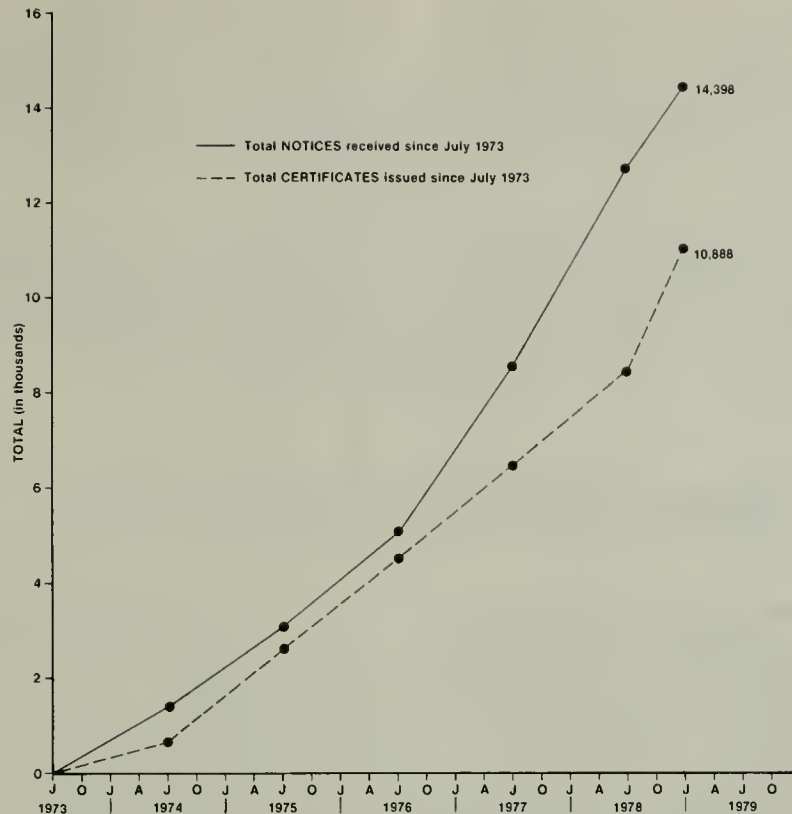


FIGURE 2-4 NOTICES OF COMPLETION FOR GROUNDWATER USE OF LESS THAN 100 G.P.M. RECEIVED AND CERTIFICATES OF WATER RIGHT ISSUED

The right to the use of water, whether under permit or an existing water right, passes with a conveyance of the property to which it is appurtenant unless specifically expected. A person receiving an appropriation interest must notify DNRC of the conveyance. An appropriator may not sever a water right from the land to which it is appurtenant, sell a right for other purposes or to other lands, or make the right appurtenant to other lands without prior approval of DNRC. Such changes may be approved if the rights of other water users would not be adversely affected.

Between July 1, 1973, and January 1, 1979 there have been 579 applications for change or sale of water rights processed and approved.

★ The same problems associated with processing times for the applicant and the department exist for these applications. The ownership and quantification of the pre-1973 water rights to be changed, transferred or sold is the most acute problem. This is not a problem with water permits issued since July 1, 1973 because the statute was written assuming that all existing water rights would have been quantified in a short time by the court adjudication specified in the Water Use Act.

★ Another problem is that people either fail to comply with the law for changes and sales of water rights or are not aware that the law even exists.

WATER RESERVATIONS

The Water Use Act allows the "state or any political subdivision or agency thereof or the United States or any agency thereof" to apply for and receive a reservation of water, which must be approved by the Board of Natural Resources and Conservation. Reservations may be granted for existing or future beneficial water uses and to maintain a

minimum flow, level or quality of water throughout the year or at other specified periods of time. Water may be reserved by showing a purpose and need for the reservation, the amount of water required and that the reservation is in the public interest. A reservation may not affect any existing water rights.

A reservation must be reviewed by the board at least every ten years to ensure that the objectives of the reservation are being met. If not, the reservation may be revoked or modified. The date of priority for a reservation is the date the reservation was adopted by the board.

A considerable amount of staff time was expended preparing an environmental impact statement and processing 35 applications for reservation of water in the Yellowstone River basin. These applications had to be processed similarly to an ap-

plication for water use permit (figure 2-1) and recommendations prepared for the Board. Depending on the success of the reservation process for the Yellowstone, numerous applications for reservation will probably be submitted from other basins of the state.

★ Additional applications for water reservations will mean increased processing times for other pending applications for permit and a decrease in the state water planning efforts because of the diversion of the limited staff.

CONTROLLED GROUND WATER AREAS

Controlled ground water areas are those areas adopted by the Board of Natural Resources and Conservation where it has been determined that water withdrawals exceed recharge, significant disputes exist or significant withdrawals are likely to occur. Once a controlled ground water area is adopted, the withdrawals, except for domestic uses, can be decreased by order of the board so that the annual yield from recharge is not exceeded. The statute dealing with controlled ground water also specifies that the department may determine priorities and ascertain established water rights within a controlled ground water area.

★ To date only one controlled ground water area has been established—east of Terry and south of Glendive. This area was established to control water injection for oil recovery in oil fields in the area and to protect the rights of existing groundwater users.

★ So far the statute has been used very little because of limited staff to conduct the necessary data collection on the existing water rights and aquifer characteristics such as recharge rate and drawdown effects. Until data is collected, a controlled ground water area cannot be established. A bill was introduced this legislative session that provided for establishment of a temporary ground water control area in critical areas of ground water use. This bill would establish some control while the data is collected.

CENTRALIZED RECORDS

Another function of the Water Rights Bureau is the centralization of water right records. Approximately 20,000 Certificates of Water Right, Notices of Completion, Provisional Permits, pending applications for Water Use Permit, pending and approved Applications for Change of an Appropriation Water Right and Sever and Sales have been microfilmed and computerized.

Microfilming is necessary to reduce the bulk for handling and storage of centralized records and also provides for security of the records. Various specific computer programs can be designed; Table 2-1 shows several samples of computer printout, listing information alphabetically by ownership, basin and by land descriptions showing the point of diversion.

★ Records of water use and aerial photos used to compile County Water Resources Surveys are also being microfilmed to preserve the records for use in the adjudication of water rights and administration of the Water Use Act. Figure 2-5 shows the progress to date. The total program cost including labor is estimated to be \$40,000.

★ Records of county water right filings are also being microfilmed and computerized which will speed the adjudication process. It has been found that although county record systems vary, most are not indexed, so an old filing cannot be located by the point of diversion, place of use, name of original appropriator or date of priority. The project, when completed, will cost an estimated \$112,000 including labor. Figure 2-6 shows the progress to date.

TABLE 2-1 SAMPLES OF COMPUTER PRINTOUT

WR # CU OWNER'S NAME AND ADDRESS

T00040 S76N SA 01 ADAMS, LLOYD STAR PCUTE 55E74
 C00017 G76H 01 ANDERSON, OSCAR BCX 154 55R75
 C00046 G41B 01 ARNOLD, D W BANNACK STAR RT BCX 55C 55R75
 C00031 G43U 01 BARLOW, FRED RT 1 BCX 177 59041
 T00032 S41E JE 01 BIRD, LAURENCE S 5005 N MCNT AVE 59601
 C00035 G43W 01 BJORNSEN, WILLIAM B 615 NC 23RD ST 59101
 P00002 S41J 01 BUONER, STEVE E GRETA 59465
 T00016 S41S 01 BURMA, BENJAMIN L 5943C
 P00053 G41E 01 BOULDER, TOWN CF 59632
 T00059 S76H RA 01 BRANCH, HAROLD P E ADELE C 59875
 C00043 G43Q 01 BRUGAN, ROBERT C 59103
 P00020 S76LJ 01 BUTZLAFF, GEORGE E PT 2 COLUMBIA FLS MT 59512

DATE - 03/05/79

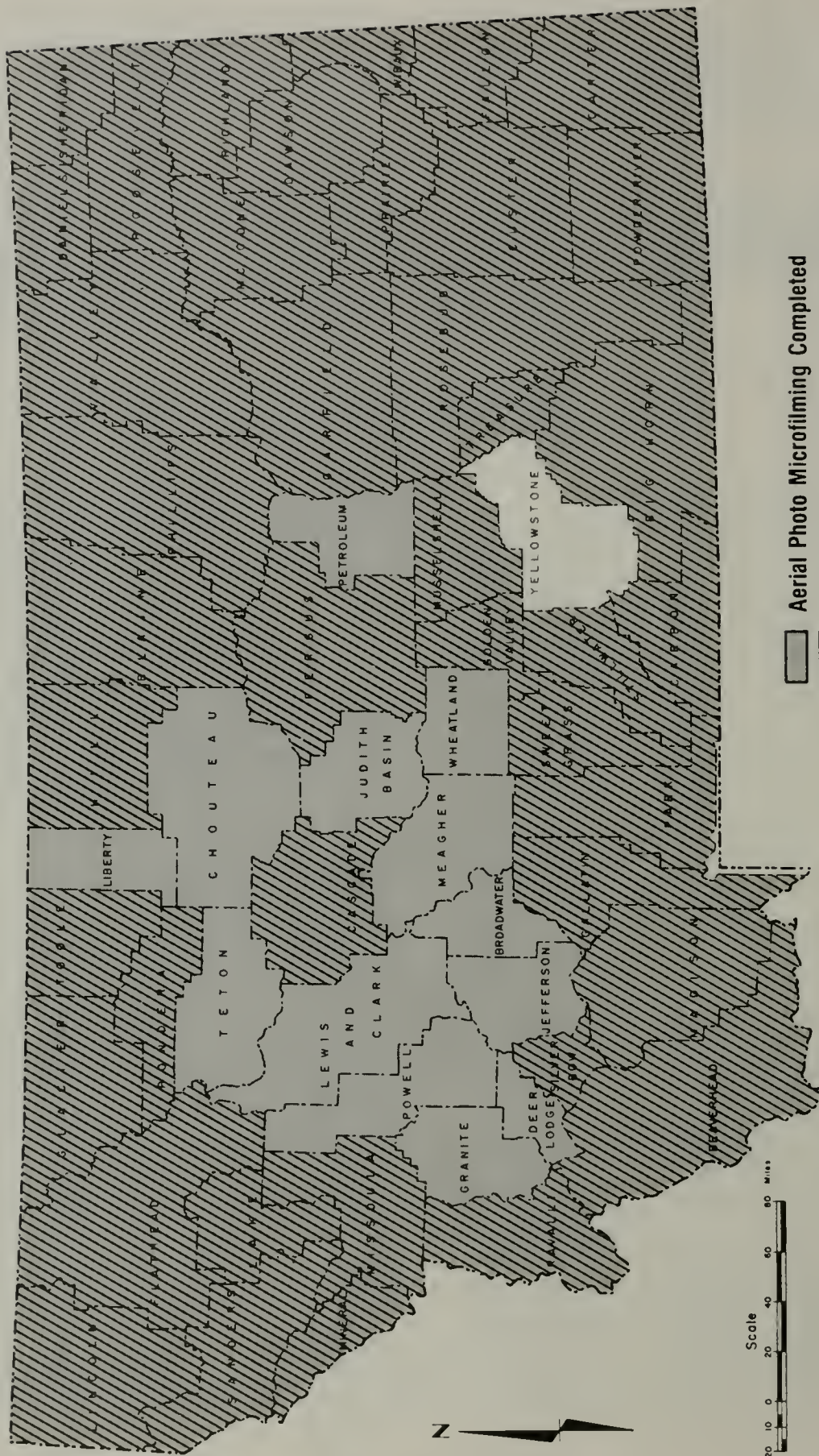
BASIN LISTING

BASIN	WR #	SOURCE	POINT OF DIV	FLOW	VOLUME	MEANS	TYPE OF	PURPOSE	NAME OF OWNER & CITY
			CU T R S	C-CFS, G-GPM	AF/YR	CF DIV	IRR SYST		
76K	P00237	SWAN RIVER SURFACE	FL 27N 19W 35	.01C	5.00	ELEC PMP		DOMESTIC STOCK	ADAMS, AUGUSTUS A & GLADYS L GREAT FALLS MT 59401
76LJ	P00133	FLATHEAD RIVER SURFACE	FL 30N 21W 24	1.5CC	135.00	ELEC PMP	SPRINKLER	IRRIGATION	MCCALLUM, ROBERT W & SHIRLEY COLUMBIA FLS MT 59512
76LJ	P00002	STILLWATER RIVER SURFACE	FL 29N 22W 11	2.0CC	100.00	PUMP	SPRINKLER	IRRIGATION	HUTCHINSON, PAUL W KALLISPELL MT 55501
76LJ	P00020	TRUMBULE CREEK SURFACE	FL 30N 21W 12	.02C	3.0Q	PUMP	SPRINKLER	IRRIGATION	BUTZLAFF, GEORGE E COLUMBIA FLS MT 59512
76LJ	P00313	WHITEFISH RIVER SURFACE	FL 30N 21W 27	4.00C	306.00	PUMP	SPRINKLER	IRRIGATION	CARTER, JACK A (TR) LITTLETON CO 80122

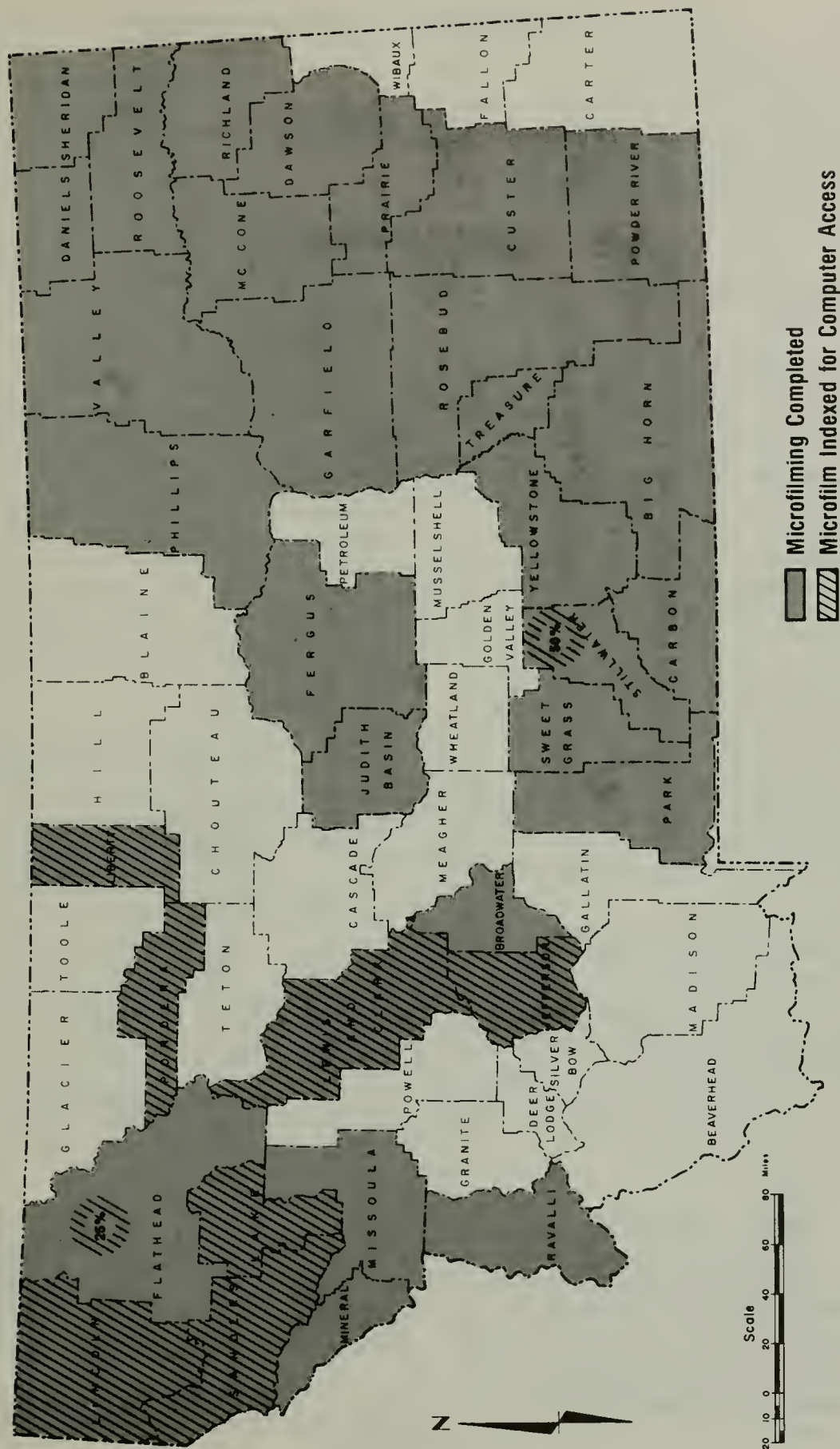
DATE - 03/05/79

LAND DESCRIPTION LISTING

BASIN	WR #	SOURCE	POINT OF DIV	FLOW	VOLUME	MEANS	TYPE OF	PURPOSE	NAME OF OWNER & CITY
			CU T R S	C-CFS, G-GPM	AF/YR	CF DIV	IRR SYST		
76LJ	C00029	WELL	FL 30N 21W 05	25.00G		PUMP		DOMESTIC	ROCKSUND, WM E ERMA WHITEFISH MT 59937
76LJ	P00020	TRUMBULE CREEK SURFACE	FL 30N 21W 12	.02C	3.00	PUMP	SPRINKLER	IRRIGATION	BUTZLAFF, GEORGE E COLUMBIA FLS MT 59512
41H	P00033	WELL	GA 01N 05E 31	3.30C		PUMP	SPRINKLER	IRRIGATION	SANCE, VERNOR S BELGRADE MT 55714
41G	C00066	WELL	GA 02N 01E 25	10.00G		ELEC PMP		DOMESTIC	BROCK, CONRAD C & HELENE THPEE FORKS MT 59752
41H	P00001	WEST GALLATIN RIVER SURFACE	GA 01S 04E 22	302.00		DITCH	FLOOD	IRRIGATION STOCK	MORGAN, MARVIN M & HELEN R ECZEPAN MT 59715



**FIGURE 2-5 COUNTY WATER RESOURCES SURVEYS MICROFILMED
As of July 1978**



**FIGURE 2-6 WATER RIGHT APPROPRIATIONS MICROFILMED
As of July 1978**

STATUS OF PRESENT ADJUDICATION

After passage of the Water Use Act in 1973, DNRC chose to begin adjudication of water rights in the Yellowstone River basin because of the basin's impending industrial uses of water, its water supply problems and its lack of past documentation of water usage.

The current adjudication process briefly consists of eight steps:

1. DNRC first obtains an order from the court requiring each person within a specified area claiming an existing water right to file a declaration.
2. Then the department must issue public notice and send an individual notice to each landowner.
3. The department reviews each declaration, compiles aerial photos, applicable water-right filings and county water resources survey data.
4. DNRC personnel field-investigate the claimed water right, determining such things as the place of use, point of diversion, actual use, amount of water used, etc.
5. Next, the department interviews the claimant, collects data to determine the validity of the filing and the date of first use, and reviews the field data collected with the claimant.
6. This data is submitted to the court by the department and the court issues a preliminary decree.
7. Opportunity is given for argument, and argument is heard by the court if the claimant disagrees with the preliminary decree.
8. A final decree is issued, and the department issues a Certificate of Water Right for each water right.

POWDER RIVER BASIN

The Powder River subbasin was selected as the first in the Yellowstone River basin to be adjudicated under the Montana Water Use Act. In October 1973, the Water Rights Bureau, with a budget of \$180,000 per year, initiated the adjudication of the existing water rights in the 4,000 square mile Powder River basin. Upon gathering all land ownership records of

the area, certified individual notices were sent to about 1,000 landowners in the basin. Public notices also appeared in five area newspapers. These notices required all claimants of water rights in the basin to file a Declaration of Existing Water Rights during a one-year period ending February 1, 1975. Claimants filed about 8,400 declarations that year. Approximately 164,800 acres of irrigation and 8,000 stock reservoirs and stock and domestic wells were claimed in the basin.

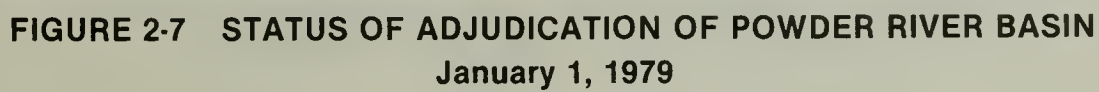
Although there are no specific written instructions from the Sixteenth District Court, it was decided in discussion with Judge Martin of that Judicial District that DNRC would prepare all facts necessary to arrive at a preliminary decree. A review of the declarations filed indicated that additional field data would be necessary to fully describe the water rights. This was especially true on irrigation claims where there had been sporadic increases in the areas irrigated and additional water sources tapped. Claimants, not knowing the details of water law, often made erroneous claims which were not necessarily in their favor.

★ About two years ago job descriptions were changed and the staff reorganized; a staff consisting of four engineers, two water rights analysts and a program manager was established. As of January 1, 1979, field investigations, interviews and data compilation had been completed on 66 percent of the claims (figure 2-7). Data has been compiled on 67,138 acres of declared irrigation (figure 2-8 shows progress to date) and 5,287 developments consisting of stock reservoirs and stock and domestic wells (figure 2-9). Findings so far indicate that the percentage of actual irrigated acreage to declared irrigated acreage is 53 percent.

★ By July 1980, all data is expected to be collected and compiled for the Powder River basin. Shortly thereafter a preliminary decree can be issued by the Sixteenth District Court.

★ Since the Powder River basin is the first basin to be adjudicated, the time necessary for the court to conduct hearings and prepare the final decree is unknown. There are no Indian reserved water rights in this basin; this lessens the chance for extended litigation.

★ Based upon progress made in the Powder River basin, it is estimated that completion of the



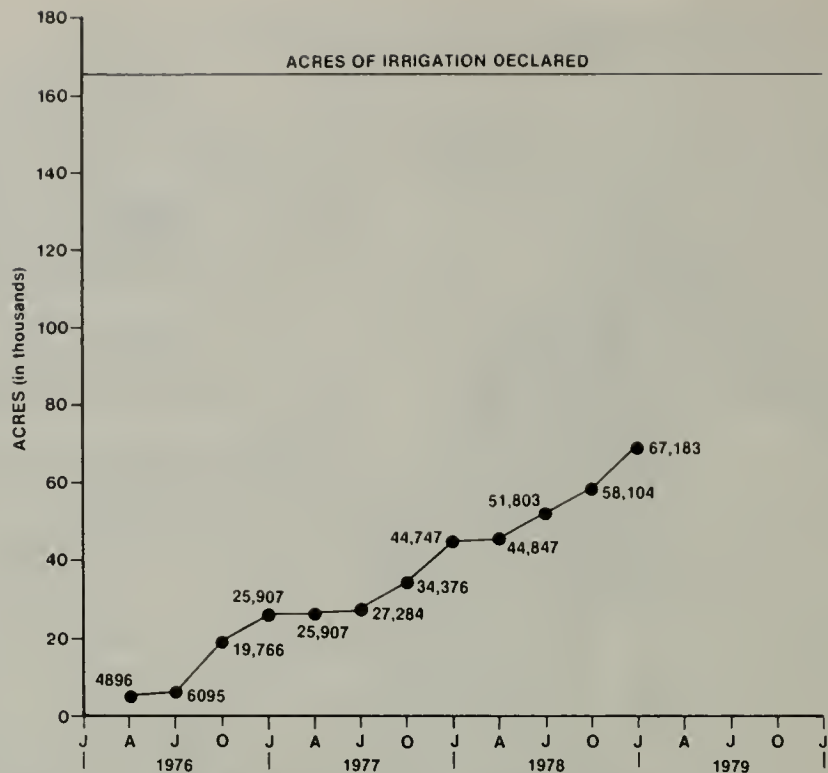


FIGURE 2-8 NUMBER OF ACRES INVESTIGATED IN THE POWDER RIVER BASIN (Based on Declaration)

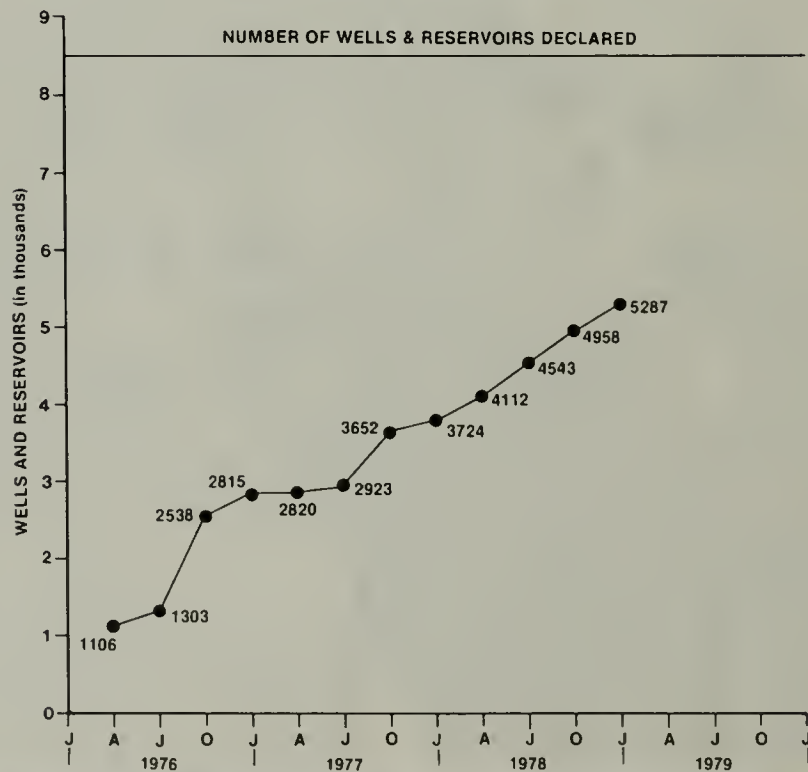


FIGURE 2-9 NUMBER OF WELL AND RESERVOIR OWNERS INTERVIEWED IN THE POWDER RIVER BASIN

work to the preliminary decree stage in the entire Yellowstone River basin would cost an estimated \$10 million and take about 60 years at the current funding rate of \$180,000 per year.

Modifications to Speed Adjudication

Since the passage of the Montana Water Use Act there has been no substantial modification of the adjudication statute except that the order calling for claims of water rights is now issued by the court instead of the department. This amendment was mainly to get federal water claims into the adjudication system.

The budget allocation of \$180,000 per year has been constant since the passage of the act. Within the limits of the budget, there have been modifications of procedures and technique to speed up data collection phase.

When data collection was first begun, procedures were not established, specific irrigation practices for the area were not known by the Water Rights Bureau and techniques for compiling the data were not established. With the immeasurable aid of several local irrigators, the Cooperative Extension Service and the Soil Conservation Service, a procedure was established in July 1976 for determining the amount of water which could be beneficially used with various types of water spreading systems in the area.

★ Starting in July 1976, graduate agricultural engineers were hired to fill existing staff positions as these positions became vacant. Most of the agricultural engineers not only had farm or ranch backgrounds but were trained in irrigation techniques and water requirements considering soils and crops. This training and background has accelerated the collection and compilation of water right data in the basin. Before July 1976, progress had been at the rate of about 5,000 declared acres per year. It is now slightly over 20,000 acres per year.

★ To streamline the water adjudication process, the bureau discontinued field-checking all claims for stock and domestic use in January 1977 because most facts could be gathered from the claim, from aerial photographs and from claimant interviews. For claims where the water right claimants did not, or would not, quantify their use a standard was adopted for stock and domestic ground water use of 10 to 15 gallons per minute and 1.5 acre-feet per household or 100 head of stock.

★ Data collection and compilation is a long and laborious process. It is necessary, however, because most claimants are not familiar with water right law and have only a limited knowledge of how to quantify their water rights. The bureau will strive to look for new procedures and re-evaluate existing procedures to speed up the process.

★ It appears that under the current statute the only way to accelerate the adjudication of water rights, especially in areas of many disputes, is increased funding for the program. At a time when there is limited general fund money available, an evaluation of existing funded programs must be made to determine priorities.

TONGUE AND BIGHORN RIVER BASINS

Work has begun on the determination of water rights in the Tongue and Bighorn river basins and Rosebud and Armells creek basins. The adjudication staff has spent considerable time gathering and updating ownership records, preparing aerial photos, county filings and other data in these basins.

★ Orders for declarations of water rights have been held pending because of litigation in federal court concerning jurisdiction over Indian and federal water rights.

VOLUNTARY DECLARATIONS

Senate Joint Resolution No. 48 of the 1977 legislature directed DNRC to request that voluntary declarations of all existing rights outside of the Powder River basin be filed with the department by each claimant and to conduct an education campaign to inform water users of the requested filings.

Shortly after this resolution passed, House Bill 809 of the 1977 legislature was introduced and discussed. The legislature decided not to pass HB 809 and to establish through SJR 81 an interim legislative committee to review the present adjudication methods and progress. This committee has reported its findings and recommendations to the 46th legislature in SB 76 introduced this legislative session.

In HB 809, the legislature considered requiring that claims for all existing water rights established prior to July 1973 be filed statewide during a specific four-year period. Since there was a possibility that this may be considered again in 1979, DNRC felt that it would be unwise to encourage voluntary declarations of existing water rights until after the 1979 legislative session. Montanans filing voluntary declarations would again have to file a declaration or claim of their existing water rights under a proceeding to adjudicate water.

★ The voluntary declaration of existing water rights will not speed up the initial compilation of existing water rights. Under current state statute

declarations are made only after a court order is issued within the designated area. Even though voluntary declarations may have been submitted for that area, additional declarations will again be required by the court from each claimant within the designated area during the time specified in the court order.

★ In light of minimizing government spending and unnecessary activity, the best thing for the individual to do now is to begin the collection of facts and data to be used later in completing and supporting his claims to existing water rights. Because of legislation which may be submitted by the interim legislative committee, it may be more productive for the state and the individual to have individuals prepare claims but not submit them.

★ All potential claimants should be encouraged to begin collecting historical data and facts pertaining to their water rights. The collection of these facts and data involves a considerable amount of time and effort, but when declarations are requested, the information necessary to file a claim would be readily available.

★ The Water Rights Bureau has drafted a brochure titled "Document Your Water Rights" to guide potential claimants in gathering the necessary facts and data concerning their water rights for future adjudication.

WATER CONSERVATION PROJECTS

Most water storage or distribution projects currently administered by DNRC were constructed by the State Water Conservation Board, formed in 1935 during nationwide depression and serious drought. These projects were built with financial assistance from the federal Public Works Administration as a means to provide emergency employment and to help stabilize Montana's agricultural economy.

The Water Resources Division is charged with administering over 40 state-owned water conservation projects (figure 3-1). Most of the projects are administered through contractual agreements with local water users associations. These water marketing contracts require associations to repay the state's investment in the project and to collect and expend an operation and maintenance (O&M) charge in exchange for delivery of the water. To save money and run the projects more efficiently, most of the associations have agreed to operate the projects themselves, with DNRC maintaining a supervisory capacity. Information on many of the projects is given in Table 3-1. More complete information is available in *State Water Conservation Projects*, a 1977 DNRC publication.

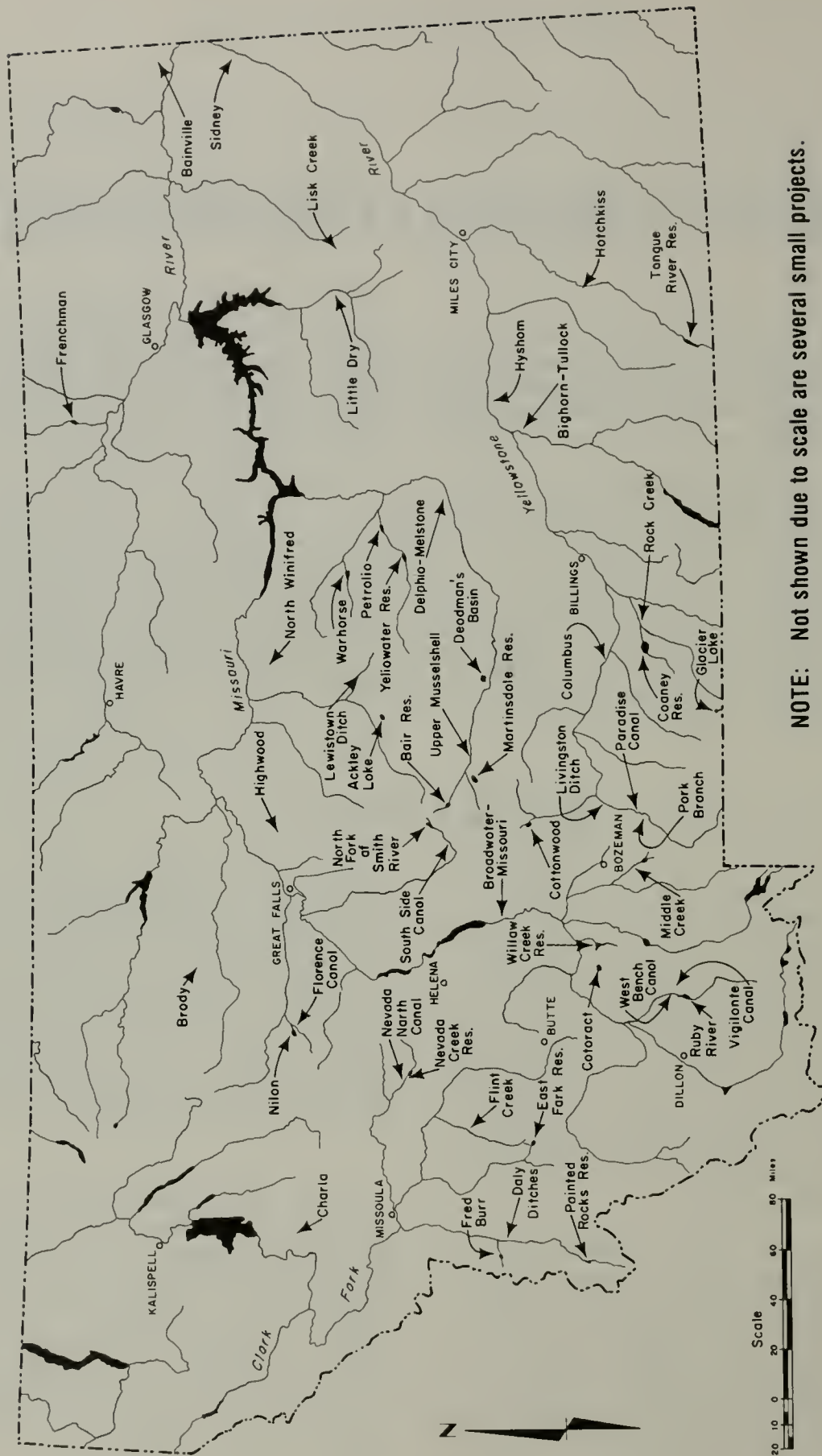
STATE LIABILITY

Because of deterioration with age, design deficiencies during construction and insufficient or incorrect maintenance and repair, many of the projects now require substantial, expensive rehabilitation. Some state-owned dams pose an unacceptably high danger to people living below them. Although the projects made possible the successful development of many acres of irrigation, vastly improving the economy of some areas of the state, a few projects have deteriorated so seriously that the water users associations may be forced to endure extreme financial burdens to keep the projects functional. A few others no longer function at all.

There are several obvious examples of this deterioration. The most serious problem, the Tongue River Dam spillway, is described in the following section. The spillway of Cooney Dam of the Rock Creek Project must be replaced, as must the spillways of Tongue River Dam and Nevada Creek Dam. A report on Cooney Dam describing the repairs needed, their cost and a proposal for financing was completed in December 1978. Spillways of several

other project dams need repair or replacement. Outlet tunnels of several dams, most notably those on the Painted Rocks, Tongue River, Nevada Creek, Ackley Lake, Yellowstone and Middle Creek projects, are in frequent need of repair. Also, there are hundreds of miles of canal which need lining and other forms of repair. A list of potential rehabilitation needs is shown in Table 3-2. For each project a brief description of possible repair needs is given along with a preliminary cost estimate.

As the owner of these projects, the state has a tremendous potential liability. Should one of the deteriorated projects fail and cause property damage or death, the state could be sued. Under the terms of the water marketing contracts and Section 85-6-107, MCA, the settlement or award from such a lawsuit is chargeable to the local water users association, if one exists. Although some project user associations carry liability insurance, the amount carried would not compensate the damages caused by failure of a dam.



NOTE: Not shown due to scale are several small projects.

FIGURE 3-1 MAJOR WATER CONSERVATION PROJECTS

TABLE 3-1. STATE WATER CONSERVATION PROJECTS

Project	Year Completed	Storage Capacity (acre-feet)	Water Still Available For Sale (acre-feet)	Type of Project ¹	Maintenance By Assn.	Benefits ²	Comments
Ackley Lake	1938	5,815	2,140	R, D	X	a, r	Project no longer operational.
Big Dry		3,800		R, C			Feasible for hydroelectric generation.
Broadwater-Missouri	1959			D	X	a	Serious leakage at dam prevents water sales.
Catacart		1,478		R			Water Users Assn. will own project at end of contract period.
Charlo	1948	40,000 gal.		C, M	X	d	Ways of increasing storage studied.
Columbus	1938			D	X	a	Feasible for hydroelectric generation.
Cottonwood	1953	2,200	0	R	X	a	Serious leakage at dam prevents water sales.
Daly Ditches	1895, 1901			D	X	a	Water Users Assn. will own project at end of contract period.
Deadman's Basin	1941	76,900	0	R, D	X	a, r	Ways of increasing storage studied.
Delphia-Melstone	1949, 1955			D	X	a	Shortage of water.
Flint Creek	1938	16,040	0	R, D	X	a	Shortage of water.
Fred Burr	1948	516	0	R	X	a	Shortage of water.
Frenchman	1951	7,010	0	R, C	X	a	Shortage of water.
Green Mountain	1940			D	X	a	Shortage of water.
Hotchkiss				D	X	a	Shortage of water.
Hysham	1950			P	X	a	Shortage of water.
Lewistown Ditch	1953			D	X	a	Shortage of water.
Lisk Creek	1937	700		R	X	r	Shortage of water.
Little Dry	1937			D	X		Shortage of water.
Livingston Ditch	1937			D	X	a	Shortage of water.
Middle Creek	1951	8,027	0	R, D, M	X	a, d	Shortage of water.
Nevada Creek	1940	12,640	3,405	R, D	X	a	Shortage of water.
Nilan-Florence Canal	1955	10,092	1,500	R, D	X	a	Shortage of water.
N. Fork Smith River	1936	11,600	0	R	X	a	Shortage of water.
N. Winifred	1938	335		R, C		r	Shortage of water.
Painted Rocks	1939	32,362	24,000	R	X	a, r	Shortage of water.
Park Branch-Paradise Canal	1957			D	X	a	Shortage of water.
Petrolia	1951	9,102	0	R, C	X	a	Shortage of water.
Red Butte Creek	1938	470		R	X	a	Shortage of water.
Rock Creek	1937	28,395	0	R	X	a	Shortage of water.
Ruby River-West Bench	1938	38,850	13,785	R, D	X	a	Shortage of water.
Canal-Vigilante Canal							Shortage of water.
Sidney	1939			P	X	a	Shortage of water.
South Side Canal	1950			D	X	a	Shortage of water.
Theboe Lake		830		R	X	a	Shortage of water.
Tongue River	1940	69,439	0	R	X	a, r	Shortage of water.
Upper Musselshell	1939	30,134	3,100	R, D	X	a	Shortage of water.
Warhorse	1938	19,250		R, D	X	a, r	Shortage of water.
Willow Creek	1938	18,000	2,722	R	X	a	Shortage of water.
Yellowwater	1939	4,242	0	R, C	X		Shortage of water.

¹C - Canal

D - Diversion dam and canal

M - Municipal water supply

P - Pumping diversion and canal

R - Dam or reservoir

²a - Agricultural water use

d - Domestic water use

r - Recreational water use

The cost of one million dollars of liability coverage ranges from \$400 to \$800 per project. On a few of the smaller projects, this nearly doubles the annual O&M budget. Of 18 dam project associations, nine have liability insurance policies, and of 13 canal project associations, four have insurance. The Charlo Project, a domestic water supply, as yet has no coverage. The remaining projects owned by the state have no active associations; for these the state faces a direct liability should damages occur. The one million dollar insurance policy held by projects with dams is likely to be inadequate if the dam should fail. Insurance is simply not an adequate substitute for a reasonably safe dam.

In a continuing program to improve the projects, the department is attempting to rehabilitate projects in immediate need of repair and to divest itself of any property interest in projects where future state involvement is not desirable. Representatives of DNRC maintain frequent contact with active water users associations by attending policy meetings, such as annual stockholders meetings, and by annually inspecting dams. Associations are advised of maintenance, repair, operational and budgetary needs. The department is working with the associations and state and federal agencies to determine the best repair alternatives and to find financing for the repairs.

TABLE 3-2. REHABILITATION NEEDS OF STATE WATER CONSERVATION PROJECTS

Project	CANAL REPAIRS	Cost Estimate (In thousands of \$)
	Repair	
Bainville	Reclaim and abandon	50
Broadwater-Missouri	Repair pipe flume over Missouri River	100
	Canal Lining	300
Columbus		
	Canal Cleaning and Repair and Measuring Devices	20
Daly Ditches	Ditch Repair	1,000
	Republican and Hedge Diversions	2,000
Deadman's Basin	Ditch Lining and Repairs	1,500
Delphia-Melstone	Ditch Lining and Structure Repair	500
Green Mountain	Canal Lining	50
Hysham	Canal Lining	300
Lewistown Ditch	Diversion Dam	50
Livingston	Diversion Dam	100
Nevada Creek	Canal Lining	200
Nilan-Florence	Canal Lining	500
Paradise	Measuring Devices and Lining	100
Park Branch	Diversion Dam	800
Petrolia	Canal Lining	500
Ruby River		
West Bench	Canal Lining	500
Vigilante	Canal Lining	500
Sidney	Pump Repair	20
South Side Canal	Canal Lining	50
Upper Musselshell		
Two Dot Canal	Canal Lining	1,000
TOTAL		10,140

SPILLWAY AND OTHER REPAIRS TO DAMS

Project	Repair	Cost Estimate (In thousands of \$)
Ackley Lake	Outlet Tunnel Repair	20
Cataract Dam	Leaking Dam	300
	New Spillway	300
Cottonwood	Spillway	200
Fred Burr	New Spillway	500
Flint Creek	Canal Lining and Repair	300
	Spillway	1,500
Frenchman	Spillway	1,300
Little Dry	Dam Construction	5,000
Middle Creek	Spillway	1,000
Nevada Creek	Spillway	1,500
N.F. of Smith River	New Spillway & Outlet Repairs	1,500
Painted Rocks	Enlarged Spillway	1,300
North Winifred	Breach Dam	200
Petrolia	Spillway	1,300
Rock Creek		
Cooney	Spillway	2,000
Glacier Lake	Dam Seepage	300
Ruby River	Spillway	2,000
Tongue River	New Spillway	32,000
Upper Musselshell		
Bair Reservoir	New Spillway and Outlet Repairs	1,500
Warhorse	Dam and Canal Repairs	100
Willow Creek	New Spillway	1,500
Yellowwater	Spillway & Outlet Tunnel Repair	100
TOTAL		55,720

PROJECTS FOR WHICH NO SIGNIFICANT REPAIRS ARE PLANNED

Big Dry	Failed twice. No plans to rebuild
Charlo	Good condition
Red Butte Creek	Breached by DNRC. No plans to rebuild
Hotchkiss	Condition is adequate
Sehm	Dam Breached. No plans to rebuild
Todd	Condition unknown
Valentine	Dam Breached. No plans to rebuild
Wold	Condition unknown

TONGUE RIVER DAM

The condition of the spillway of the Tongue River Dam is probably the most serious problem on all of the projects. This spillway is in poor condition and is too small to handle a large flood without causing the dam to fail. Failure of the dam could cause millions of dollars worth of damage in addition to the loss of the reservoir and the benefits it provides.

During the flood of May 1978, the spillway sustained heavy damages and was very close to failure. DNRC spent nearly \$10,000 on a 24-hour-a-day watch of the dam during the flood.

DNRC now faces a decision on what to do about the Tongue River Dam. The options are:

1. Replace the spillway and raise the dam. The cost of construction is \$33 million to \$43

million and the cost of additional land could be prohibitive until coal mining is completed in the area. Some 60,000 acre-feet of water would be available for sale, however.

2. Build a new dam downstream. The cost of construction is \$63 million and land costs may be lower than the above option. About 60,000 acre-feet of water would be available for sale.
3. Breach the dam. This option would cost about \$2 million. All project benefits would be lost.

Some repairs must be made now regardless of the option chosen because several years will pass before any major repairs or construction can be completed (with the exception of option number three).

RECOMMENDED ACTION

A *Conceptual Plan for State Water Projects* was approved by the Board of Natural Resources and Conservation in March 1978. The purpose of this plan was to set out a definite program for the rehabilitation of the state's projects to reduce the potential liability for damages that could be caused by failure of project facilities. It does not address the special problems at Tongue River Dam.

There are eight major elements or phases in this new conceptual plan for state water projects. These are shown schematically in Figure 3-2 and with a proposed time schedule in Figure 3-3. In summary, the eight phases are:

- I. Addition of hydroelectric generation facilities to three state-owned dams—initial increment.
- II. Establishment and operation of an earmarked revolving fund and program of rehabilitation of existing projects.

- III. Addition of hydroelectric generation facilities to state-owned dams—second increment.
- IV. Cooperative installation of hydroelectric generation facilities on privately owned dams in the state.
- V. Constructing new water development projects.
- VI. Addition of hydroelectric generation facilities to state-owned dams—final increment.
- VII. Address problems of the state-owned and operated Daly Ditches Project at Hamilton. Consider the disposition of project to the local organization.
- VIII. Explore non-water-related assets of state-owned water projects and continued disposition of those water project assets which are no longer useful or essential to the state-owned water projects system.

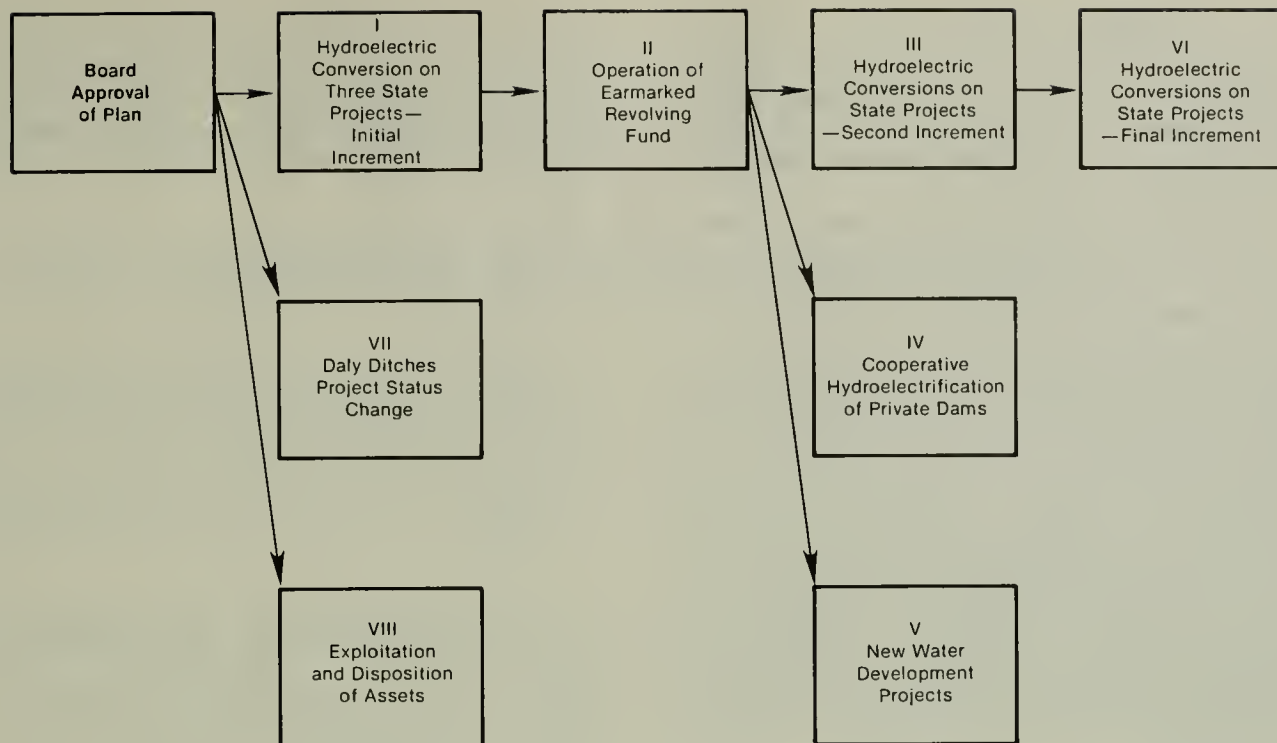


FIGURE 3-2 CONCEPTUAL PLAN FOR MONTANA WATER RESOURCES PROJECTS

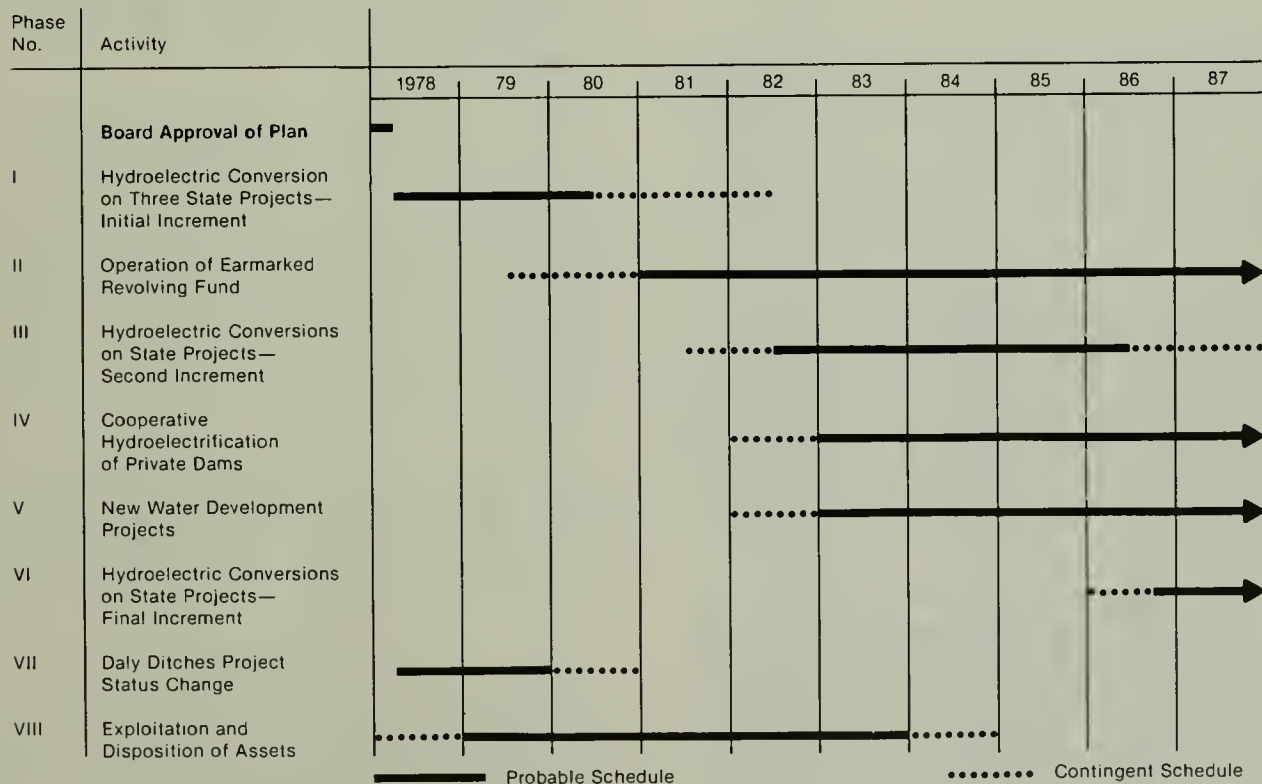


FIGURE 3-3 STATE WATER DEVELOPMENT PROJECTS SCHEDULE

HYDROELECTRIFICATION

A key factor in implementing the state project plan is the hydroelectrification of state-owned water projects. Because of the growing energy crisis, the relative low cost of installation of electrical generation equipment on existing dams and the environmental advantage of hydroelectric generation compared to coal-fired electric generation, the department believes that there is a ready market for hydro-electricity generated on existing state-owned dams. To date the state's effort, through DNRC, on this plan was to fund a recently completed feasibility study by Tudor Engineering Company of San Francisco, California.

Proceeds from sale of hydroelectric power generated on state-owned projects could be used for the repair of existing projects and the design and construction of new projects. The operation of hydroelectric facilities on state-owned dams would be to maximize income to implement the state water project plan, rather than to produce electricity at minimum cost.

★ It is recommended that the hydroelectrification plan be advanced as rapidly as possible so that sufficient funds can be made available to rehabilitate state-owned water conservation projects.

Alternatives to the recommended plan would be to not construct hydroelectric facilities at state dams or lease project lands and facilities to private interests. Either action would greatly reduce or eliminate earmarked revenues for use in rehabilitating existing state projects or building new ones.

In the past, funds to rehabilitate projects have been secured from federal grants and loans, legislative grants and loans and increased water rates to irrigators. Due to the high costs of major structural repair and replacement, the unavailability of state general funds, limited federal grants and loans and the limited repayment capacity of projects based totally on irrigated agriculture, these options are limited.

★ Contracts for energy sales must be signed before final design plans and specifications can be prepared. Some additional preliminary work can be done by DNRC if federal grants or services are provided. The federal Department of Energy has granted \$97,000 to the department to conduct model studies for alternate designs for a generating plant at the Broadwater-Missouri Dam near Toston and the U.S. Bureau of Reclamation may be able to provide some assistance on that project.

★ As a start in implementing its project plan, DNRC has selected three projects for hydroelectric studies; a high head installation, a low head installation and a project using an off-stream storage site. The three potential hydroelectric projects that were selected for study are:

1. Painted Rocks Dam on the West Fork Bitterroot River, Ravalli County, a high-head installation;
2. Broadwater-Missouri Dam on the Missouri River, Broadwater County, a low-head installation; and
3. Deadman's Basin, Wheatland County, an off-stream storage dam near the Musselshell River.

★ An assessment of the potential energy that could be generated at each site was computed based on hydrological records and physical characteristics of the site. A computer program, simulating the seasonal flow characteristics of the watershed and operation of the plants, was used to perform the energy studies. The three projects combined indicated a potential annual generation of 105 million kilowatt-hours having an estimated market value in excess of \$2.7 million annually. This energy is equivalent to that produced by approximately 60,000 tons of coal in a modern coal-fired electric generating station.

★ An economic evaluation of costs and benefits indicated that the three projects as a group would result in a benefit-cost ratio of 1.62 to 1. The Federal Energy Regulatory Commission (formerly the Federal Power Commission) has unofficially indicated that benefit-cost ratios of 0.70 to 1 are justifiable for construction in today's markets when comparing hydropower to a fossil fuel-fired plant where the latter's cost of energy will inflate over time.

★ Potential markets for this power were identified in the study, as was a means of delivering the energy to the power purchaser. REA's and the Montana Power Company are the most likely purchasers.

DALY DITCHES

★ DNRC has initiated efforts to dispose of Daly Ditches and has begun to evaluate the potential for exploitation of non-water-related assets of state-owned water projects. Disposition of the Daly Ditches Project is hampered by uncertainties in existing contracts between DNRC and the water users.

A lawsuit has been pending in this matter for several years and very little progress has been made in settlement of the lawsuit. In the meantime, DNRC has agreed to accept water payments that are less than one-third of the cost of delivering the water. The re-

maintaining two-thirds must be paid from the state general fund. Due to present funding, the project is deteriorating, thereby increasing the state's potential liability for damages that could result from failure of a deteriorated structure.

REPAYMENT OF THE STATE'S INVESTMENT

Since the beginning of the water conservation program in 1935, the state has invested nearly \$14 million in the major projects, in addition to a large amount of federal financing. At present-day costs, these projects would have cost many times that amount.

There are four main ways DNRC expects to recover additional revenue from the projects:

1. Additional water sales from those projects having water available.
2. Renegotiation of present water purchase contracts to provide for full recovery of the state's investment in that project.
3. Annual industrial sales from the Tongue River Reservoir. These sales will eventually bring \$100,000 annually under existing contracts.
4. Favorable judgement in the Daly Ditches lawsuit. Loss of the lawsuit will increase the unsecured debt.

Because the original objectives of the water conservation program were to build water conservation projects and put people to work, recovery of the state's investment had received little consideration until recently. Many problems encountered during design and construction of the projects resulted in the necessity to alter or repair some of the projects soon after they were constructed. As a result of these and other problems, the state has been unable to fully recover its investment on some projects under existing contracts. The department has been trying to secure, under new contract, as much of the previously unsecured debt as possible. Continued progress is expected. Figure 3-4 graphically shows how the unsecured debt has been reduced during the last six years. Table 3-3 gives additional details on project finances.

★ At the request of the legislative auditor, the Engineering Bureau is completing critiques of each project. Each critique is to be a complete engineering, economic and financial analysis of the project.

The critiques should identify actions needed to make a project structurally and financially stable and recommend the degree of future department involvement. Alternatives available to the department for each project include: (1) rehabilitating the project and retaining state ownership, (2) releasing the ownership of the project to interested water users associations, or (3) abandoning the project after taking measures to permanently eliminate all safety hazards. At this time, three critiques of major projects have been nearly completed (Broadwater-Missouri, Deadman's Basin and Delphia-Melstone) and several minor projects have been abandoned or released.

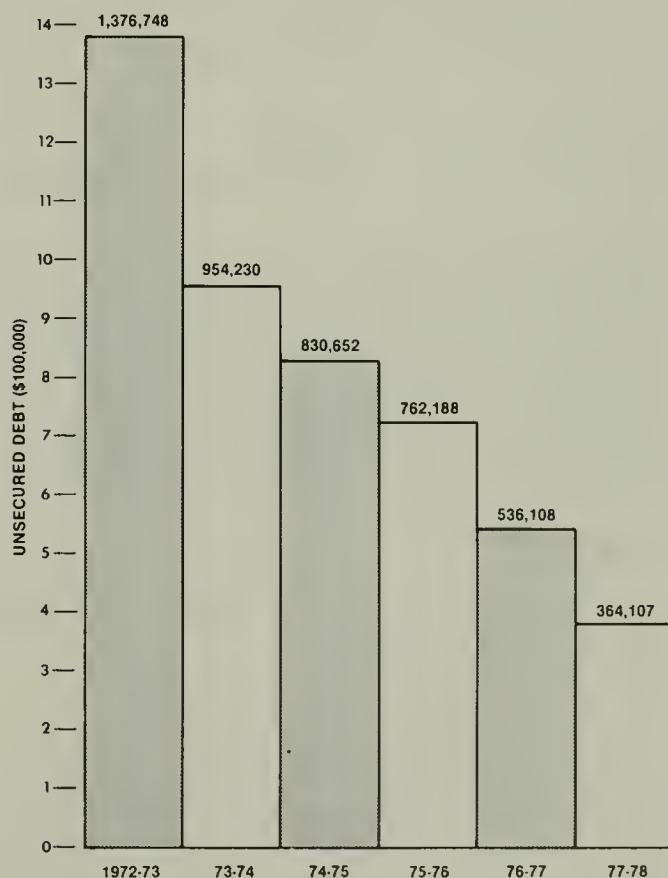


FIGURE 3-4 STATE WATER CONSERVATION PROJECTS UNSECURED DEBT

★ Progress toward the rehabilitation of the projects and the completion of project critiques has been slow. The department staff assigned to this task is too small, and the amount of funds available to loan for rehabilitation is extremely limited. Four engineers and two technicians from the Engineering Bureau are not a sufficient staff to respond to emergency situations as they arise. Anticipated problems often cannot be solved before they become emergencies. A great deal of time is spent locating federal funds to make the necessary repairs.

In the past, the water users associations have been able to obtain cost sharing grants from the Agricultural Stabilization and Conservation Service and the Resources Conservation and Development

Program and low-interest loans have been obtained from the Farmers Home Administration.

★ The department was permitted to loan \$220,000 from its own funds during fiscal years 1976 and 1977 for project rehabilitation. The budget for the next biennium is expected to be only \$288,000, a small amount compared to the cost of the anticipated repairs. For example, \$450,000 was required to repair the outlet tunnel at Painted Rocks Dam; \$100,000 was expended to line two miles of small canal on the Petrolia Project; an estimated \$1.5 million will be required to repair the Nevada Creek Dam spillway; \$1.9 million is the estimated cost of repairing the Cooney Dam spillway and as much as \$60 million may be needed to replace the Tongue River Dam spillway if that option is decided on.

TABLE 3-3. WATER CONSERVATION PROJECT FINANCIAL STATEMENT SUMMARY

	FISCAL YEAR					
	1973	1974	1975	1976	1977	1978
Bonded Projects ¹						
Total State Investment	\$6,611,501	\$6,934,079	\$6,959,775	\$6,960,363	\$7,003,832	\$7,075,788
Fiscal Year Charges	322,578	25,696	588	43,469	71,956	11,332
TOTAL INVESTMENT	6,934,079	6,959,775	6,960,363	7,003,832	7,075,788	7,087,120
Total Cash Receipts	4,810,650	4,971,981	5,151,380	5,320,906	5,510,529	5,730,315
Fiscal Year Income	161,331	179,399	169,526	189,623	219,786	143,901
TOTAL RECEIPTS	4,971,981	5,151,380	5,320,906	5,510,529	5,730,315	5,874,216
Balance Due State	1,962,098	1,808,395	1,639,457	1,493,303	1,345,473	1,212,904
Accounts Receivable	2,535,267	2,492,742	2,402,723	2,323,396	2,226,237	2,261,760
NET POSITION	+ 573,169	+ 684,347	+ 763,266	+ 830,093	+ 880,764	+ 1,048,856
Non-Bonded Projects ²						
Total State Investment	4,771,793	4,772,586	4,773,305	4,787,941	4,793,173	4,834,581
Fiscal Year Charges	793	719	14,636	16,537	41,408	194
TOTAL INVESTMENT	4,772,586	4,773,305	4,787,941	4,804,478	4,834,581	4,834,775
Total Cash Receipts	1,208,351	1,244,566	1,292,197	1,351,815	1,417,370	1,487,227
Fiscal Year Income	36,215	47,631	59,618	65,555	69,857	72,318
TOTAL RECEIPTS	1,244,566	1,292,197	1,351,815	1,417,370	1,487,227	1,559,545
Balance Due State	3,528,020	3,481,108	3,436,126	3,387,108	3,347,354	3,275,230
Accounts Receivable	1,578,103	1,842,531	1,842,208	1,794,827	1,930,482	1,862,267
NET POSITION	- 1,949,917	- 1,638,577	- 1,593,918	- 1,592,281	- 1,416,872	- 1,412,963
TOTAL NET POSITION (35 Projects)	- 1,376,748	- 954,230	- 830,652	- 762,188	- 536,108	- 364,107

¹Financed primarily through sale of revenue bonds

²Financed with both state and federal funds

DAM SAFETY

The preceding chapter lists many deficiencies in state-owned dams. Dams not owned by the state may have similar problems. Inspections by qualified engineers are required to determine the potential hazards resulting from dams that are in poor condition.

INSPECTION OF STATE-OWNED DAMS

State-owned dams have been inspected regularly for the past several years by a dam safety engineer employed by DNRC. The department spends about \$30,000 a year on this program. Major expenses include salaries, travel and equipment. Table 4-1 lists all inspections during the last six years. These inspections have turned up many deficiencies, some

of which have required emergency repairs. Unfortunately, these inspections are not thorough enough to find all potential problems. Studies are needed to determine whether spillways are large enough and whether the stability of the dam is within acceptable limits.

STATE DAM SAFETY LAW

In addition to inspections of state-owned dams, DNRC has authority to inspect all other dams in the state that are 25 feet or higher or that store at least 50 acre-feet of water. In the past few years, DNRC has inspected several dams at the request of owners of downstream property or of the owner of the dam. This law also authorizes county commissioners and judges to order inspections of any dam in the state.

Due to an increase in inspections of non-state-owned dams and the need to use the DNRC dam inspector as a construction inspector during repairs resulting from dam inspections, DNRC's ability to inspect its dams has been reduced. As a result, the department has not been able to maintain annual inspections of all of its dams.

FEDERAL DAM SAFETY LAW

Based on a 1973 inventory of dams conducted by DNRC, 103 non-federal dams in Montana are located so that their failure could cause loss of life. The inventory, which was funded by the U.S. Army Corps of Engineers, enumerated some 1,700 dams and listed pertinent data for each one. This inventory probably lists only about one-half of the dams in the state that are at least 25 feet high or can store at least 50 acre-feet of water.

In 1978, DNRC, with funding from the U.S. Army Corps of Engineers, began an inspection program which will eventually produce a report on all dams in the state which pose a significant threat to life and property due to the location of the dam. These reports will identify further investigations or repairs that may be needed. At the same time a process was begun to obtain a comprehensive inventory of all dams in Montana. DNRC will hire consulting

engineers for most of the inspection and inventory work. The cost of these inspections, including DNRC administration, will be about \$10,000 for each dam. The total cost of repair needs identified may be several hundred million dollars.

One hundred three dams have been selected for inspection and as more dams are found that meet the criteria requiring inspections they will be added to the inventory list. No federal dams or federally

licensed dams will be inspected under this program. Dams known to be in especially poor condition can be inspected regardless of their location.

★ During this new inspection program, using modern criteria, the department expects to find many unsafe dams. It will be the responsibility of the state and counties to order owners to make the dams safe and the responsibility of the owner to make the ordered repairs.

**TABLE 4-1. DATES OF INSPECTIONS OF DAMS OWNED BY
THE DEPARTMENT OF NATURAL RESOURCES AND CONSERVATION**

PROJECT	DATE					
	1973	1974	1975	1976	1977	1978
Ackley		7/22	7/17		11/29	
Bair	11/16	10/23	1/27			4/12
Broadwater-Missouri (Toston)		11/12				
Cataract		10/18	10/20	7/12**	9/15	
Cooney	8/23	9/30	5/13-28	7/14	9/12	
Cottonwood		4/24	5/6**	7/13**		
Deadman's Basin		4/18	4/29	5/25		4/18
Flint Creek	9/13	9/10	9/12		9/26	
Fred Burr	7/19	8/20	8/19		9/9	
Frenchman	9/19	10/9	10/8	10/13	10/12	
Glacier Lake	8/22	10/1	9/19		9/20	
Martinsdale	8/20	10/22		1/27		4/18
Middle Creek (Hyalite)	9/11	9/11	9/24	11/19**	9/14	
Nevada Creek		4/23	4/22	11/22**		1/10
Nilan	11/14	8/22	8/22			
North Fork-Smith River	11/9	10/21	1/26		12/28	
Painted Rocks (West Fork)	4/30	10/29	9/23-26-29	*	9/8	
Petrolia		3/28	6/11	12/1		4/19
Ruby River	12/12	12/17	1/16		9/28	
Tongue River	10/17	10/3	9/12	10/7**	10/6	6/10
War Horse (Winnett)		2/14	7/16		6/15	
Willow Creek	9/12	9/12	9/16		9/15	
Yellow Water		3/29	7/16	11/30		4/20

* Outlet tunnel repairs inspected December, 1976 through June, 1977

** No formal inspection report written.

FLOOD PLAIN MANAGEMENT

The primary functions of the Flood Plain Management Program are to determine the 100-year frequency floodway and flood plain boundaries for all streams in Montana and to manage and regulate flood-prone lands and waters to prevent or alleviate flood threats to life and property. The Flood Plain Management Program is the state's coordinating agent for the National Flood Insurance Program for the Department of Housing and Urban Development (HUD). It assists local political subdivisions in meeting flood insurance eligibility requirements and maintains effective local-federal relationships.

In Montana, as in many other states, there are two separate programs for flood plain management. One is mandated by state legislation enacted in 1971 (Title 76, Chapter 5, MCA) and the other is the National Flood Insurance Program.

The state program places the initiative for flood plain land-use regulation at the local governmental level, but it also provides for state enforcement of flood plain regulations if local governing bodies fail to act. This program is implemented on a stream-by-stream basis in a series of successive steps.

The entire program is allocated only two engineers and a total budget of \$40,000 a year. Additional legal, secretarial and administrative staff time spent on this program is to the detriment of other programs.

FLOOD PLAIN DELINEATION

The first step toward implementation of flood plain management is the completion of a flood plain delineation study. The law requires that a flood plain area subject to flooding by a so-called "100-year frequency flood" be used as the basis for establishing flood plain land-use regulations. Determining 100-year flood limits requires a hydrological study of the stream in question.

Following the completion of a flood plain delineation study, maps showing flood plain boundaries are prepared and the department must hold a public hearing. Persons contesting the flood plain boundaries shown on the study maps can present their own data and testimony at these hearings. If

substantive map changes are required as a result of the hearing, a subsequent hearing may be required.

After the hearing(s), the Board of Natural Resources and Conservation formally establishes the delineated area as a designated flood plain. Once the flood plain has been designated, the local government has six months to adopt flood plain land-use regulations at least as stringent as the state minimum standards within the flood plain boundaries. Local regulation is encouraged by a provision in the law that gives local governments the enabling authority to specifically regulate flood plain land use through a building permit system.

NATIONAL FLOOD INSURANCE PROGRAM

The Flood Plain Management Section is the state coordinator for the National Flood Insurance Program. The primary goal of the National Flood Insurance Program is the same as the state flood plain management program—sound land-use regulation on flood plains. The National Flood Insurance Program, administered by HUD, provides low-cost, subsidized flood insurance to persons already located in a flood-prone area. Thus, the insurance serves to encourage land-use regulation and, at the same time, to indemnify flood losses to existing flood-prone property.

One of the key provisions of the Flood Insurance Act requires HUD to notify and furnish a preliminary flood hazard map to all flood-prone communities in the nation. Upon receipt of this notification, an affected community has one year to adopt minimal land-use regulations and apply for participation in the insurance program. If a community fails to act within the allotted year, some forms of federally controlled lending assistance are cut off within the identified flood-prone area.

After a community has entered the National Flood Insurance Program, HUD contracts with an agency or private consultant to perform a flood insurance study of the community's flood hazard. Following this study, the community's flood plain regulations must be revised and additional flood insurance is made available. This second level of flood insurance is obtainable only at actuarial rates, and

any new construction in the flood plain can be insured only at actuarial rates.

Many communities in Montana are affected by both the state flood plain law and the National Flood Insurance Program. Presently, 60 Montana cities, 28 counties and one Indian reservation are participating in the National Flood Insurance Program (table 5-1).

★ During Fiscal Year 1978, public hearings were conducted on completed flood plain delineation studies for major streams in Silver Bow County. With assistance from the Flood Plain Management Program, 24 communities became eligible for the National Flood Insurance Program during the past year. As of June 30, 1978, 88 Montana communities (cities and counties) were participating in the program (figure 5-1). Department enforcement of flood plain regulations continued in Cascade County, and Ravalli County began a program to regulate flood plain management locally.

★ Only Cascade County has not adopted local flood plain regulations, therefore, DNRC must retain administrative responsibility and enforce flood plain regulations.

★ To date about 1,200 stream miles have been established as designated flood plains by the Board of Natural Resources and Conservation. Local flood plain regulations have been adopted in almost all of these areas (figure 5-2).

TABLE 5-1. FLOOD PLAIN DELINEATION STUDIES COMPLETED AS OF JULY 1, 1978

Stream	County	Study Limits	Study Agency ¹	Study Detail ²	Floodway Separated From Flood Plain	Public Hearing Date
Beaverhead	Beaverhead	From 6 miles above Dillon (thru Dillon) to 5 miles below Dillon (13 miles)	Corps	1	Yes	March 15, 1976
Rock Creek	Carbon	From mouth on Clarks Fork of Yellowstone upstream to .5 miles above Montauqua (5 miles)	USGS	2	Yes	September 16, 1974
Missouri	Cascade	Black Eagle Dam upstream to a point approx. 4.5 miles past the mouth of the Sun River (6.5 miles)	Corps	1	Yes	October 12, 1976
Sand Coulee Creek & Trib.	Cascade ³	Mouth at Great Falls upstream to Stockett (20 miles)	SCS	1	Yes	September 23, 1974
Sun River	Cascade ³	Mouth at Great Falls upstream about ten (10) miles	Corps	1	Yes	August 21, 1974 September 28, 1976
East Gallatin River & Trib.	Gallatin	Mouth on West Gallatin upstream thru Bozeman (45 miles)	SCS	1	No	September 9, 1974
West Gallatin	Gallatin	Mouth near Trident upstream to approx. .25 miles above Williams Bridge near Gallatin Gateway (45 miles)	Corps	2	No	September 10, 1974 March 17, 1976
Rock Creek	Granite & Missoula	Mouth on Clark Fork River in Missoula County upstream to just above the junction of Ross Fork and West Fork in Granite County (50 miles)	USGS	3	No	September 12, 1974 February 10, 1975
Rock Creek	Granite	Five (5) mile segment of Rock Creek downstream from mouth of Ranch Creek (5 miles)	USGS	2	Yes	September 12, 1974 February 10, 1975
All major streams	Fergus	County-wide study of all major streams	FHBM	3	No	April 28, 1977
Warm Springs Creek	Deer Lodge	Mouth on Clark Fork upstream to the U.S. Forest Service boundary 10 miles west of Anaconda (23.5 miles)	SCS	1	Yes	April 25, 1977
Clark Fork	Missoula	Mouth of Bitterroot River upstream thru Missoula to Hellgate Canyon (10 miles)	Corps	1	Yes	August 13, 1974 January 14, 1975
Clark Fork Below Missoula	Missoula	Mouth of Bitterroot River to Alberton (35 miles)	Corps	2	No	August 15, 1974
Clark Fork Below Missoula	Missoula	Mouth of Bitterroot River to Hoerner Waldorf (12 miles) (Floodway only)	Corps	1	Yes	November 4, 1976

Stream	County	Study Limits	Study Agency ¹	Study Detail ²	Floodway Separated From Flood Plain	Public Hearing Date
Lolo Creek	Missoula	Upstream about 5.5 miles from mouth (5.5 miles)	Corps	1	Yes	October 21, 1976
Rattlesnake Creek	Missoula	Upstream about 6.8 miles from mouth (6.8 miles)	Corps	1	Yes	October 28, 1976
Yellowstone	Park	Mouth of Shields River upstream thru Livingston to about 2.5 miles above the Carter Bridge (15 miles)	Corps	1	Yes	April 7, 1976
Cottonwood Creek	Powell	Thru Deer Lodge city limits (1 mile)	Corps	2	No	August 20, 1974 February 18, 1975
Bitterroot	Ravalli	From Missoula County line upstream to about .5 mile above the junction of the East & West Forks (70 miles)	U of M DNRC	2	No	September 5, 1974 February 19, 1975
Rosebud Creek Tributaries	Stillwater	Junction of East & West Rosebud Creek upstream to Carbon County and Custer National Forest (40 miles)	SCS	1	Yes	January 22, 1976
Stillwater	Stillwater	Mouth near Columbus upstream thru Absarokee (17 miles)	SCS	1	Yes	November 25, 1974
Alkali Creek	Yellowstone	Upstream 1 mile from mouth on Yellowstone River (1 mile)	Corps	1	Yes	September 17, 1974
Yellowstone	Yellowstone	From Fivemile Creek upstream thru Billings to Canyon Creek (20 miles)	Corps	1	Yes	September 17, 1974
Blue Creek	Yellowstone	Mouth on the Yellowstone River to fifteen (15) miles upstream (15 miles)	SCS	1	Yes	November 1, 1977
Duck Creek	Yellowstone	Mouth on Yellowstone River upstream about three (3) miles near the confluence of East Fork Duck Creek (3 miles)	SCS	1	Yes	November 1, 1977

¹FHBM = Flood Hazard Boundary Maps

DNRC = Department of Natural Resources and Conservation

Corps = U. S. Army Corps of Engineers

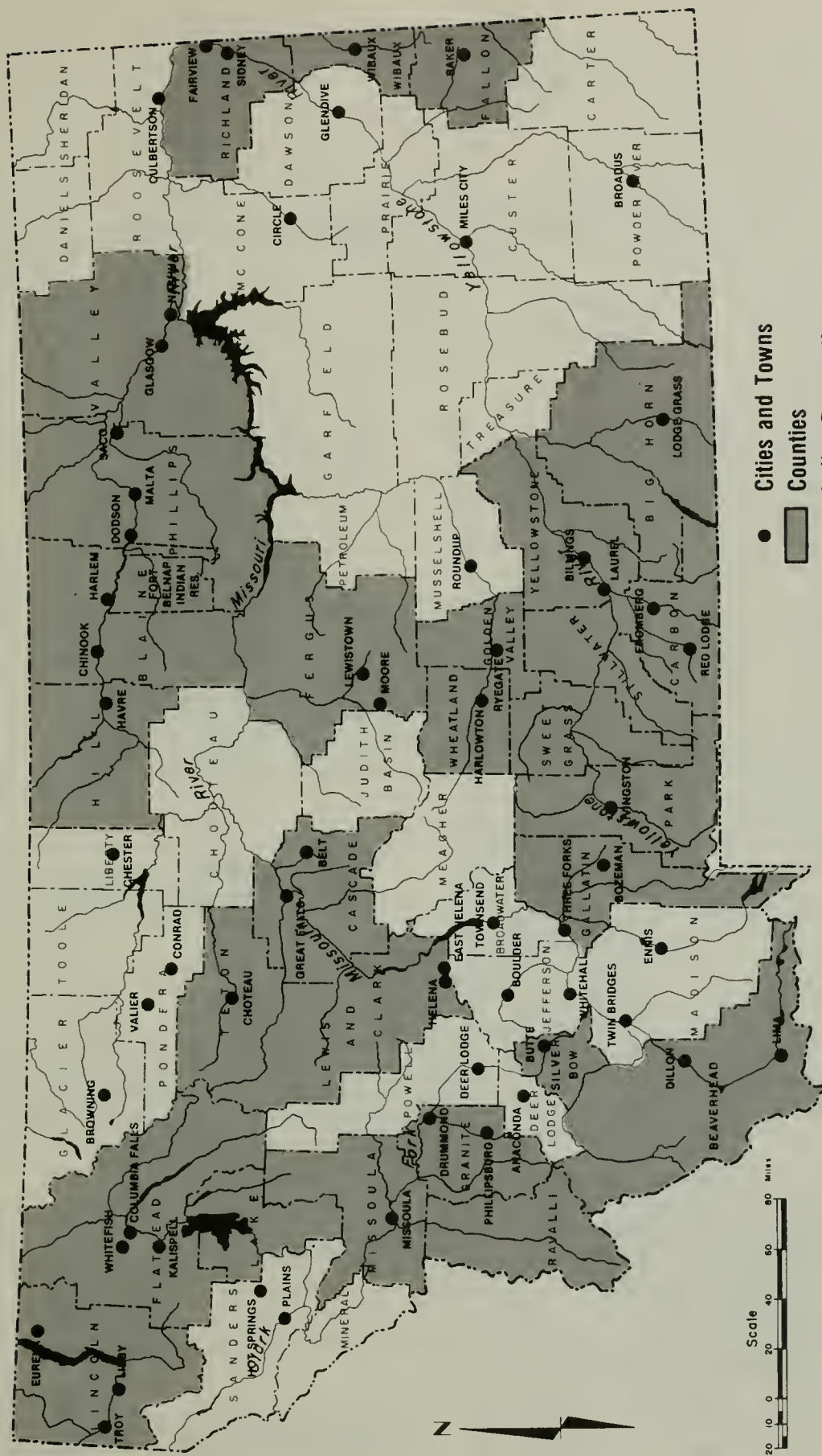
SCS = U. S. Department of Agriculture, Soil Conservation Service

²1. Detailed flood plain study; contains good cross-section and flood elevation data or good historical information. Equivalent to Corps FPI reports.

2. Some detailed information available; lacks good mapping and/or flood elevation data for some areas.

3. Equivalent to U.S.G.S. flood-prone quad map delineations.

³State Regulation by DNRC currently in effect.



**FIGURE 5-1 COMMUNITIES ELIGIBLE FOR FLOOD INSURANCE
Through June 30, 1978**

RESEARCH ACTIVITIES

HIGH PLAINS EXPERIMENT

The High Plains Experiment, commonly referred to as HIPLEX, is a cooperative research venture between the Bureau of Reclamation, DNRC, private and university groups. Its primary objectives are:

- (1) to develop an effective technology for increasing rainfall from spring and summer convective storms over the semi-arid High Plains; and
- (2) to be able to apply this technology for increasing the quality and quantity of crop and forage production and for providing more water for irrigation, municipal use and hydroelectric power generation with no or minimal environmental and social problems.

The High Plains were chosen for the experiment because this area is considered semi-arid and a 10-to 20-percent increase in rainfall can be expected to benefit the citizens of this area considerably.

Many scientific uncertainties still exist concerning the predictability and effectiveness of cloud seeding as well as its impacts on agriculture and on natural ecosystems. Because of these uncertainties, and because of the potential importance of cloud seeding to the United States, Congress in 1973 delegated to the Bureau of Reclamation's Office of Atmospheric Resources Management (OARM) the responsibility of developing the technology of seeding spring and early summer clouds over the semi-arid High Plains regions. To represent the varying climates of the northern, central, and southern High Plains, OARM selected three field sites: one each in Montana, Kansas, and Texas. The Montana research site, encompassing a 100-mile radius of Miles City, is headquartered at the Miles City airport (figure 6-1).

The meteorological portion of HIPLEX includes three sequential phases. During Phase I (1975-1978),

how natural clouds behave and produce rain was investigated. Three or more cloud physics aircraft, an extensive rain gauge network, two specially designed weather radars, several hundred weather balloons (rawinsondes), sophisticated computer and forecasting systems and many other instruments were used during the field season (May through July) to measure the micro-physical processes of clouds, the amount of rain these clouds produce and their life cycles. From this information, cloud-seeding hypotheses will be formulated and tested.

Beginning in 1979, and lasting three to five years, Phase II involves seeding towering cumulus clouds and studying small thunderstorms. The smaller towering cumulus clouds will be seeded on a random basis and the unseeded clouds (control cases) will be compared with the seeded clouds. When enough seeded and unseeded clouds have been studied, the results will be compared statistically. In addition, some small thunderstorms will be studied in detail to develop cloud seeding hypotheses for Phase III. During Phase III, the smaller thunderstorms (cumulonimbus) will be seeded randomly. The amounts of rain the seeded and unseeded storm systems produce will also be compared statistically. If Phase III is successful, a scientifically sound technology for rainfall augmentation will be available to the High Plains states.

Studies being carried out concurrently with the meteorological work of HIPLEX involve determining and evaluating the short-, mid- and long-term impacts and benefits for precipitation enhancement programs on the economy, society, agriculture and natural ecosystems of the High Plains.

Responsibilities of DNRC, as stated in the cooperative agreement between DNRC and OARM include:

- (1) Providing an independent analysis and

evaluation of HIPLEX meteorological data;

- (2) Disseminating information generated from HIPLEX to Montanans;
- (3) Assisting in designing HIPLEX research; and
- (4) Determining and evaluating the social, agricultural, geographical, legal, environmental and economic impacts and benefits of spring and early summer rainfall augmentation programs in Montana and the northern Great Plains.

★ Research efforts being carried out or completed by DNRC include:

- (1) Completing studies on the rainfall climatology of eastern Montana.
- (2) Designing a very sophisticated network of weather stations in eastern Montana to learn what triggers large convective storm systems (thunderstorms) and how they work. Fifty specially designed solar-powered telemetrized weather stations are planned for installation in the spring of 1979 in a

uniform spatial arrangement northeast of Miles City (figure 6-2).

- (3) Completion of a study determining the effects of 38 years (1938-1976) of precipitation and temperature on the native range vegetation, specifically forage production in eastern Montana.
- (4) A study of the short- and mid-term effects of rainfall on the native range ecosystems of eastern Montana is continuing. Two irrigation studies (six years in duration) were initiated to determine how the seasonality, frequency and amount of additional rainfall can be modified to increase range production and the nutrient content of vegetation as well as documenting changes in plant composition and the effects on other ecosystem parameters (figure 6-2).
- (5) A study of the effects of seasonality, frequency and the amount of additional rainfall needed to increase the quality and quantity of major cereal grains in central and eastern Montana has begun.

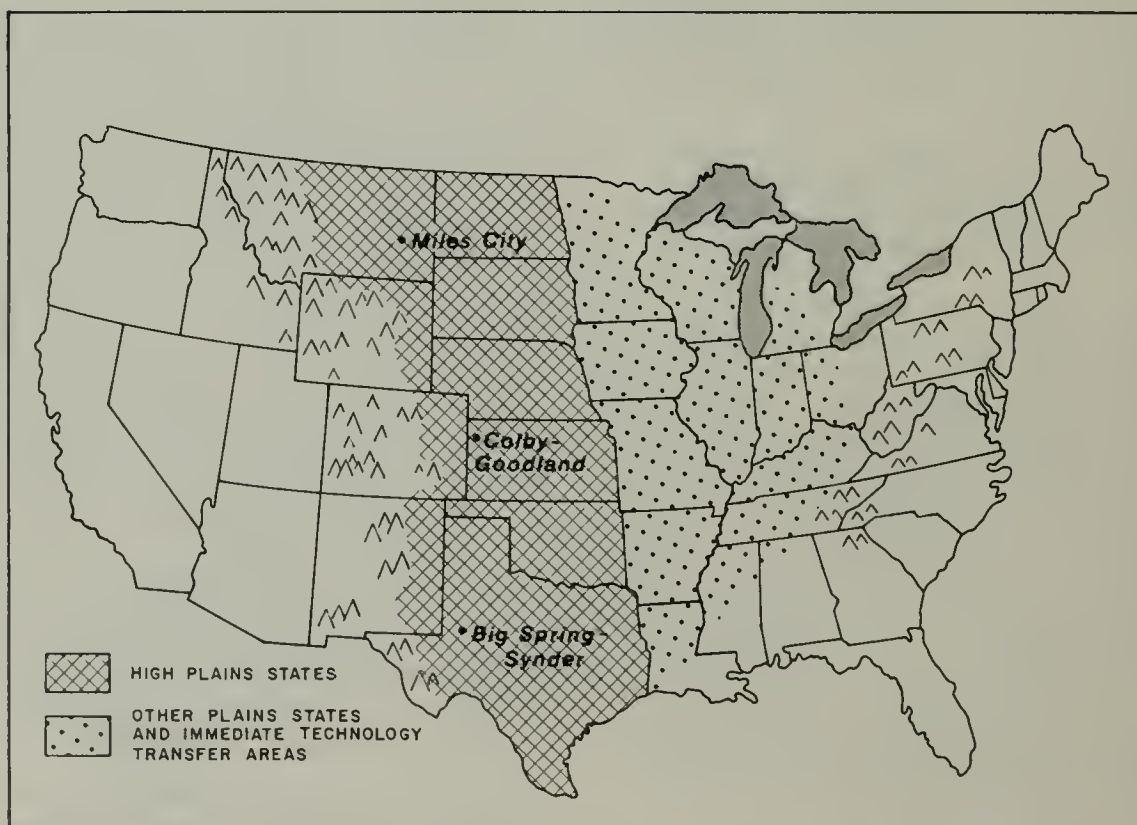


FIGURE 6-1 HIPLEX STUDY AREA AND LOCATION OF FIELD SITES

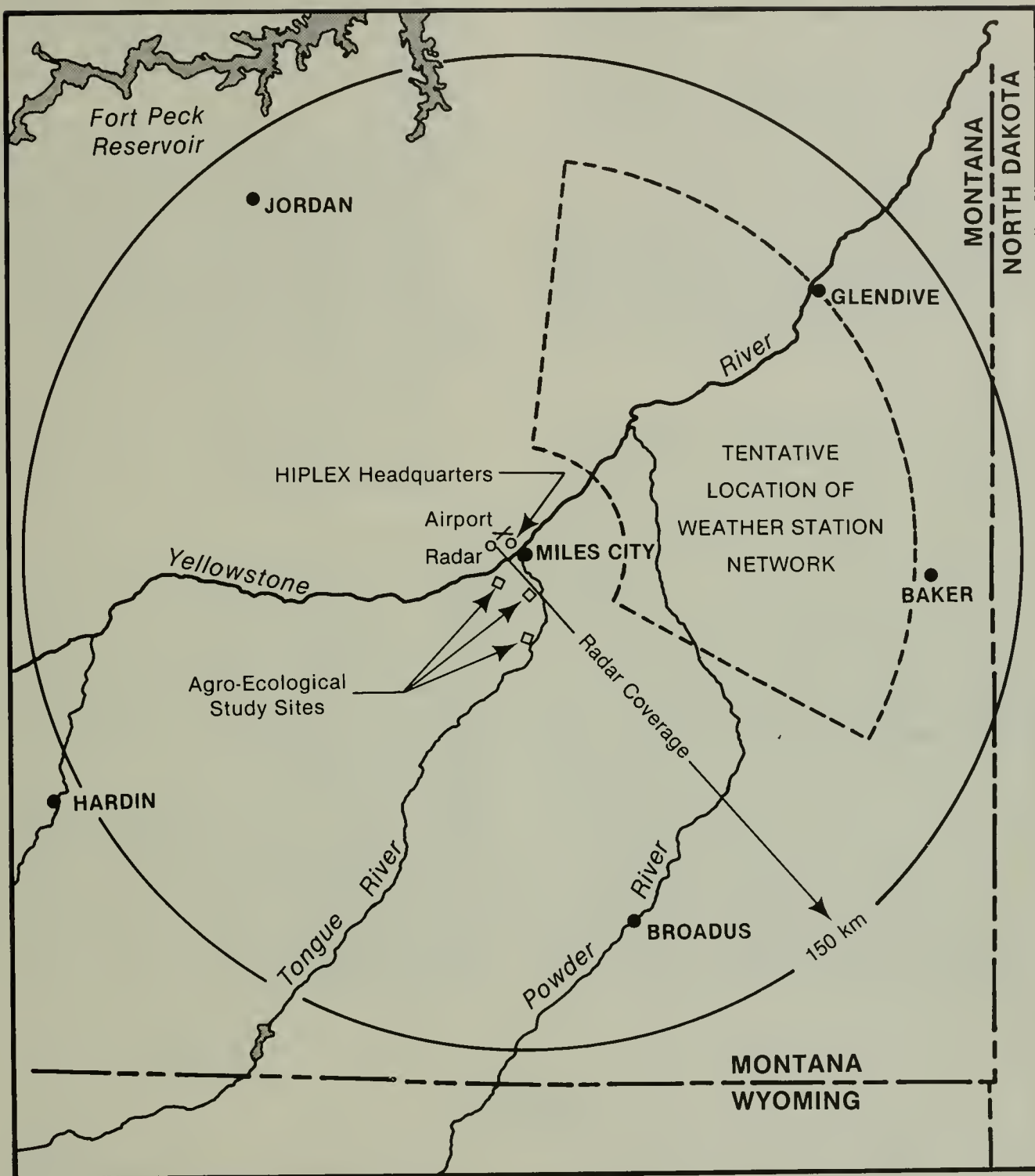


FIGURE 6-2 MONTANA'S HIPLEX STUDY AREA

- (6) An irrigation study was initiated to determine the short- and mid-term effects of additional moisture on primary consumers (above ground and below ground herbivores, such as grasshoppers and cattle) and the energy transfer between trophic levels. This study is important because grasshoppers, aphids and other insects can compete very effectively with cattle and sheep for forage.
- (7) The information derived from the irrigation studies will be used to test or verify computer models which should show the water-use efficiencies of native range vegetation and winter wheat, and the effects of additional moisture on plant and animal biomass, plant nutrient content and plant and animal reproduction.
- (8) One experimental approach to assess the long-term consequences of precipitation programs on the High Plains is to look at the way nature and man modify the environment under the natural precipitation gradients which exist across the High Plains. This study entitled The HIPLEX Homoclimate Study, is planned to begin in 1979. Changes in land-use patterns, agricultural production, social and economic structure of the community, floral and faunal communities and other ecological variables will be analyzed along three precipitation gradients extending across the northern, central and southern High Plains from the eastern side of the Rock Mountains to the Mississippi River. An interdisciplinary research team consisting of plant and animal ecologists, meteorologists, agricultural economists, sociologists, hydrologists, statisticians and demographers will cooperate in fulfilling the project's objectives. The results derived from this project should provide a quantitative assessment of the probable long-term conse-

quences of increased precipitation on the High Plains and how various climatic variables interact to affect agricultural production, land-use patterns, energy development and many other economic and social variables.

- (9) An extensive rain gauge network has been installed and operated, and software procedures have been developed for processing precipitation data and transcribing all rain gauge data into computer-compatible form. A considerably larger rain gauge network is tentatively planned for Phase III to verify actual increases of rainfall on the ground.
- (10) The "Weather Modification Bulletin" continued to be published in cooperation with Montana State University, Department of Earth Sciences. The purpose of the bulletin is to educate Montanans in the "state of the art" of cloud seeding and to disseminate information generated from HIPLEX research.

In summary, the HIPLEX research effort is just beginning to provide important information on how summer thunderstorms work and on the potential for seeding these storms to increase rainfall over eastern Montana. In addition, state HIPLEX biologists, in cooperation with scientists from Montana State University and other research organizations, are ascertaining the impacts and benefits that additional rainfall will have on agriculture and the native rangeland ecosystems.

★ Most of the state HIPLEX program is federally funded, except for the biological studies which are determining the short- and mid-term effects which additional rainfall has on crop and forage production. Continued state financial support of \$50,000 for the 1979-80 biennium is essential to complete those studies and to insure continued federal financial support.

LANDSAT

DNRC is involved in a series of cooperative demonstration projects with the National Aeronautic and Space Administration (NASA). During this one-time study, cooperative efforts are being carried out by scientists from within several state agencies, state universities and Cascade County. This group is generally referred to as the Montana LANDSAT Team (figure 6-3).

The area in Montana which is being evaluated (figure 6-4) is about 100 miles by 200 miles; two different LANDSAT satellite scenes are involved as indicated.

★ The goal of this demonstration project is an evaluation of LANDSAT and high altitude remote sensing technologies in the measurement of the

natural resources of Montana; technological effectiveness as well as costs will be weighed. Many agencies might make use of the techniques; therefore, the potential savings are considerable. For instance, multiagency use of this technology can result in cost savings for corridor siting of highways, transmission lines and pipelines. Agricultural lands can be monitored for production estimates, water use and the conversion of rangeland or prime agricultural lands to other uses. Land use can be mapped for county planning, tax evaluation and water use management projections. Timber lands may be monitored for disease control, inventories, management practices and for tax valuation. If this technology is usable, future interagency cost-sharing is anticipated which in turn should

reduce duplication of data gathering by separate agencies.

★ NASA is funding a major portion of the demonstration costs; the respective agencies and universities are providing salaries primarily for training state personnel and for field corroboration of LANDSAT computer interpretations.

★ The demonstration projects that DNRC has assisted in are: (1) dam inventory, (2) forestry resources and (3) agricultural land resources. If successful, the three projects will bear directly on providing a useful and updated base to assist in the formulation of the State Water Plan.

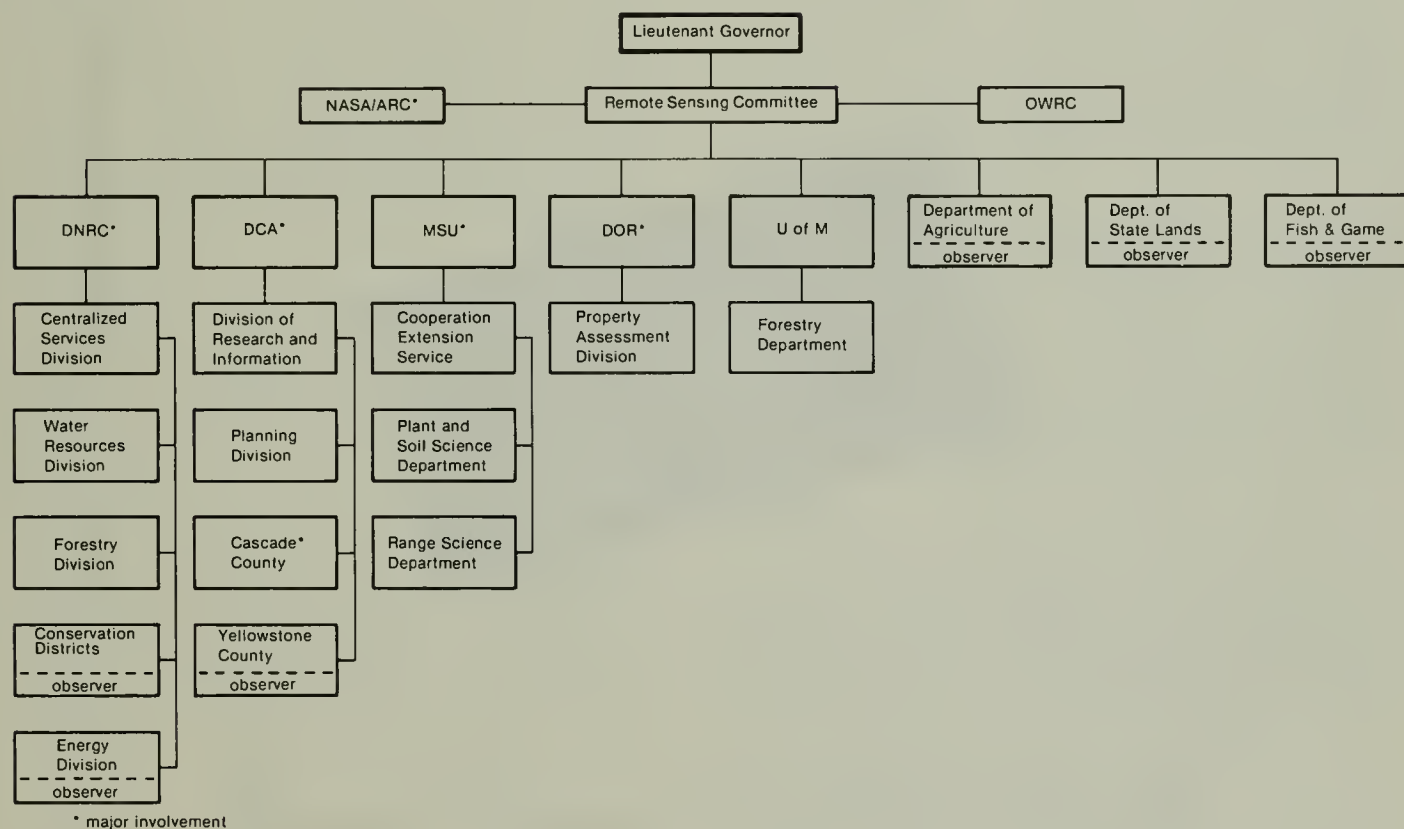


FIGURE 6-3 MONTANA LANDSAT TEAM
as proposed

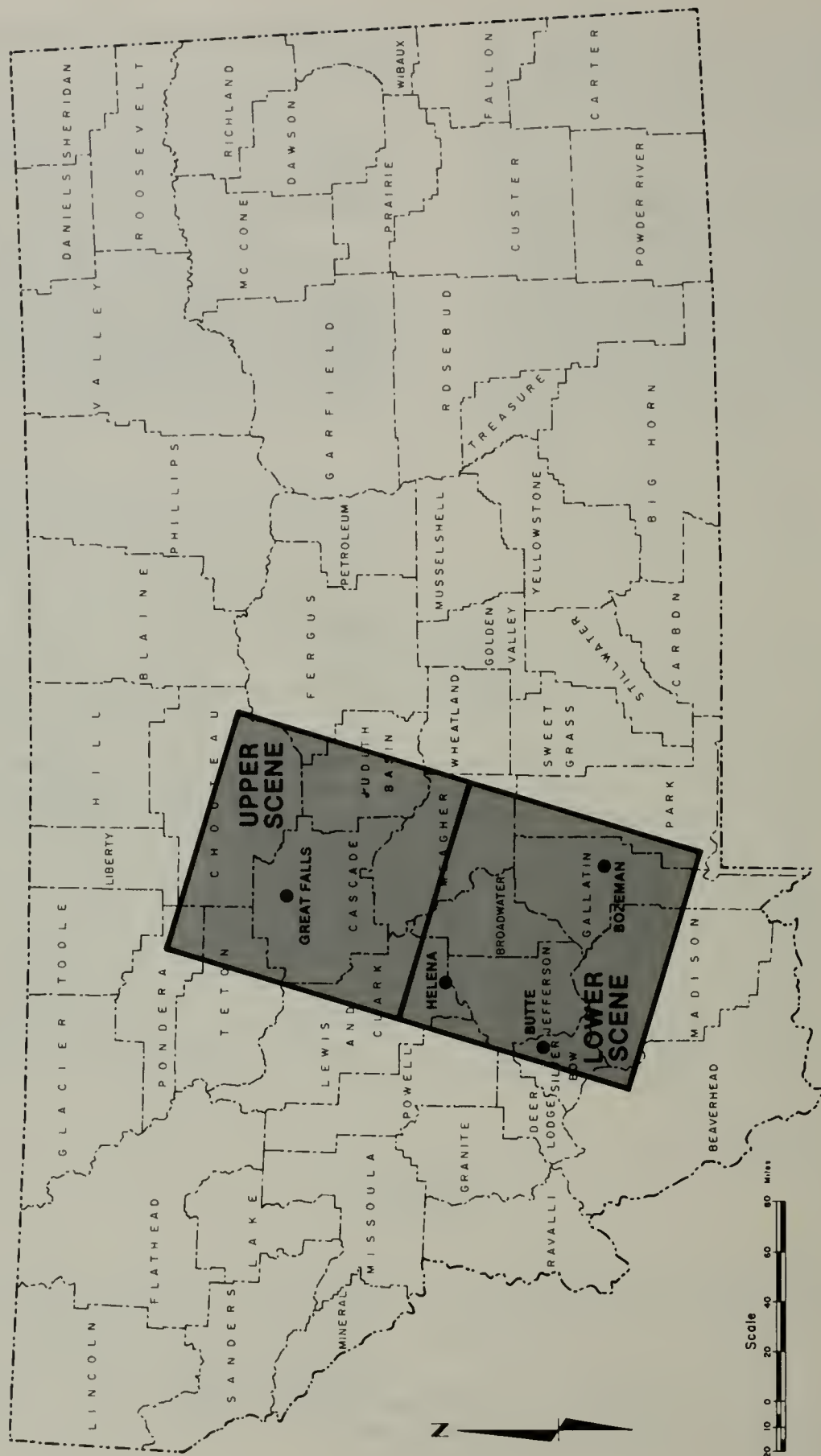


FIGURE 6-4 MONTANA LANDSAT STUDY AREA

WATER RESOURCE DEVELOPMENT

TECHNICAL ASSISTANCE TO WATER RESOURCE PROJECTS PROGRAM

The program of Technical Assistance to Water Resource Projects (TAP) was established within the Water Resources Division during fiscal year 1976. Its function is to provide assistance to local groups in planning projects that will avert the problem of acute water shortage during periods of drought. The end product of a TAP study is a prefeasibility report to the requesting local groups covering organization, developable resources, development solution alternatives, additional investigation requirements, project feasibility, funding opportunities and environmental impact. Proposed water projects that would be considered include domestic, municipal, industrial, irrigation, fish and wildlife, recreation, flood control, water quality maintenance and improvement, drainage and sediment and erosion control.

Local groups may contact the Water Resources Division and request that a prefeasibility report be prepared for a particular project. Water Resources Division staff generally arrange a field review of the proposed project with the requesting group. At that time the amount of data available, the amount of interest shown, the amount of staff work required and the general feasibility of the overall project are assessed. The staff then reports to an advisory group of DNRC personnel who sets final priorities on all requests. Data is collected from field trips, previous studies and other agencies, and a final report is prepared. Upon completion, the TAP report is presented to the requesting group with conclusions and recommendations, and any questions concerning the report are answered. It is the responsibility of the group to carry out the TAP recommendations.

Water Resources Division staff have been involved in several projects in the past two years. The reports completed, or in progress, include a rural water system, four irrigation storage projects, a gravity sprinkler irrigation system and a trout processing cooperative. Several reports have been associated with Renewable Resource Development requests. Division staff, through these reports, have assisted in the evaluation of Renewable Resource Development projects.

★ With water shortages anticipated, this program is important in the development of the water resources of this state. Numerous streams and rivers are already over-appropriated, leaving only flood flows, which must be stored, available for appropriation. This program may be the initial step in the development of a future water project, and will be even more useful as the demand for water increases.

★ Both water conservation and water storage will be of utmost importance as supplies are depleted. TAP can have a significant impact on future water use by making it possible for local groups to select the most feasible solution prior to becoming financially obligated to a project.

★ Both water conservation and water storage will be of utmost importance as supplies are depleted. TAP can have a significant impact on future water use by making it possible for local groups to select the most feasible solution prior to becoming financially obligated to a project.

RENEWABLE RESOURCE DEVELOPMENT PROGRAM

The Renewable Resource Development Program (RRD) was passed by the 1975 Montana Legislature. The intent of the program is to invest coal severance funds in Montana's renewable resources, either through direct grants or as security for the issuance of state revenue bonds. There were

two programs in the original legislation; one which has since been declared unconstitutional, would have given low interest longer term loans to Montana farmers and ranchers. The other involves grants or loans to entities of state government having the ability to tax.

PROGRAM ADMINISTRATION

The RRD program is administered by DNRC which sets application requirements and ensures that applications contain adequate data to make funding decisions. The department then prioritizes the projects and sends these recommendations to the governor's office, which must submit them to the legislature by the 20th day of the session. The legislature makes the final decision on grants and loans.

The department then contracts with the appropriate entities which have received funding for project completion. Several agencies besides DNRC are sponsoring grant applications this session, and will be involved in contractual agreements with DNRC and local government entities.

★ During the last biennium, DNRC received 16 applications for RRD grants or loans. All applications were evaluated according to how well they met the intent of the RRD program, and DNRC recom-

mended that ten of the 16 applications be awarded grants. These ten applications and the amounts recommended to be awarded to them are listed in Table 7-1.

★ There has been strong interest in the program from other government entities. DNRC has received over \$7 million in grant applications for the 1979 session (with only approximately \$2.1 million available). The program could be affected by the challenge of Montana's coal severance tax by coal and utility corporations. Obviously, if the coal severance tax were declared unconstitutional the program could no longer exist without another source of funds.

★ The effect of the RRD program is favorable to water resource management in Montana. For example, funding was granted last session for the conversion of 5,800 acres from ditch and electrical sprinkler irrigation to a gravity sprinkler system. This not only resulted in savings of electricity, but also in the amount of irrigation water used.

TABLE 7-1. DNRC LEGISLATIVE RECOMMENDATIONS FOR RRD GRANT AWARDS FOR FISCAL YEARS 1980 AND 1981.

Applicant	Project	Grant Request	Grant Recommendation
Montana Department of Agriculture	Biological Weed Control	\$ 113,200	\$ 113,200
Montana Department of Fish and Game	Streambank Preservation	250,000	100,000
Cove Irrigation	Irrigation System Repairs	800,000	40,000
City of Kalispell	Lawrence Park	1,310,700	327,680
City of Deer Lodge	Beautification Project	21,100	5,250
Triangle Area Conservation District	Saline Seep Reclamation	241,000	241,000
Montana Department of Natural Resources and Conservation	Range Land Resource Loan Program	300,000	300,000
City of Livingston	Sacajawea Park	458,778	114,700
Glenn Lake Irrigation District	Delivery System Improvements	675,000	33,750
Flathead Conservation District	Whitefish Lake Stabilization	264,980	70,900
TOTAL			\$1,346,480

WEATHER MODIFICATION

The Atmospheric Sciences Bureau of the Water Resources Division administers the Weather modification program. Weather modification activities, including research and development projects, are regulated by rules adopted by the Board of Natural Resources and Conservation. Any person desiring to undertake weather modification activities must secure a yearly license from the board, and must demonstrate competence in the field of meteorology. A licensee can undertake specific weather modification projects only upon receipt of a permit from the board, in addition to the license. A permit may be issued for a single geographical area for up to one year if the statutory conditions are met, including a determination that the project is for the general welfare and public good.

In 1977 and 1978 licenses and permits were issued to Colorado International Corporation of Boulder, Colorado and the North Dakota Weather Modification Board. Weather modification by Colorado International Corporation is an integral part of the High Plains Experiment (HIPLEX) in eastern Montana. The High Plains Experiment is described in chapter 6. The North Dakota Weather Modification Board requested licenses and permits to seed summertime clouds ten miles within the Montana border in an attempt to increase rainfall and decrease hail in adjacent North Dakota counties.

A P P E N D I X

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AUTHORITY

Article IX, Section 3, of Montana's Constitutions states:

WATER RIGHTS. (1) All existing rights to the use of any waters for any useful or beneficial purpose are hereby recognized and confirmed.

(2) The use of all water that is now or may hereafter be appropriated for sale, rent, distribution, or other beneficial use, the right of way over the lands of others for all ditches, drains, flumes, canals, and aqueducts necessarily used in connection therewith, and the sites for reservoirs necessary for collecting and storing water shall be held to be a public use.

(3) All surface, underground, flood, and atmospheric waters within the boundaries of the state are the property of the state for the use of its people and are subject to appropriation for beneficial uses as provided by law.

(4) The legislature shall provide for the administration, control, and regulation of water rights and shall establish a system of centralized records, in addition to the present system of local records.

The following pages contain specific information on the various elements of water law, including, water rights, ground water, water districts and water programs.

WATER RIGHTS

The Water Use Act gives DNRC the authority to determine how much water is used and for what purposes.

public use, and by the opinion of the Montana Supreme Court. An individual has the right to use the water so long as he does not infringe on the rights of prior appropriation.

APPROPRIATION DOCTRINE RECOGNIZED

The basic water law recognized in Montana is the prior appropriation doctrine. This doctrine is a **time-use** doctrine in which the concept of *first in time, first in right* is the principle criteria for determining or recognizing the relative status of alleged water rights.

ACQUISITION OF WATER RIGHTS

The Constitution of Montana, ratified in 1972, mandated the legislature to "provide for the administration, control, and regulation of water rights," and to "establish a system of centralized records, in addition to the present system of local records." Accordingly, in 1973 the legislature adopted the Montana Water Use Act, which established a uniform centralized system for the acquisition, administration and determination of water rights. While the basic concepts of the doctrine of prior appropriation were preserved, including the rule of first in time, first in right, the majority of Montana's prior statutes

OWNERSHIP

No person owns water in Montana. Rather, the state has ownership of water by virtue of the state constitution, which holds that the use of water is a

governing the acquisition of water rights were repealed.

Permit System

Water rights can no longer be acquired by posting and filing, by the mere use of water or by any other method including adverse use, adverse possession, prescription or estoppel. Except as noted below, a person may appropriate water only by applying for and receiving a permit to do so from DNRC. The permit system applies to all types of appropriations, including those of surface water, ground water, reservoirs and geothermal water. If DNRC determines that the proposed appropriation might have an adverse effect upon the rights of other persons, it is required to publish notice of the application, and also give direct notice to particular appropriators who might be adversely affected.

The notice of the proposed appropriation sets a date by which persons may file objections to the granting of the permit and request a hearing. If no objection is filed, DNRC may permit the appropriation as applied for, or it may modify the permit upon such terms and conditions that it considers necessary to protect prior rights. If valid timely objections are received, the department will hold a public hearing pursuant to the Montana Administrative Procedure Act at which the objectors and the applicant may appear to present testimony and evidence for and against the application.

A permit may be issued for less water than is requested, but never for more water than applied for or than can be beneficially used without waste. The priority date of the appropriation is the date the permit application is filed with the department.

Beneficial use is the key to the entitlement to water use. It is defined broadly as a use of water for the benefit of the appropriator, other persons or the public and specifically includes, but is not limited to, agricultural (including stockwater), domestic, fish and wildlife, industrial, irrigation, mining, municipal, power and recreational uses.

The only exception to the permit requirements of the Act is that, outside the boundaries of a controlled ground water area, a permit is not required to appropriate ground water through a well or developed spring yielding less than 100 gallons of water per minute. Within 60 days of completion of the well, the appropriator must file a notice of completion with DNRC, which then issues a certificate of water right. The priority date begins with the filing of the notice of completion.

Changes, Transfers and Abandonment

The Water Use Act provides that an appropriator may not change the place of diversion, purpose of use or place of storage without receiving prior approval from DNRC. The test for approval of such a change is whether it would adversely affect the rights of other persons. If the department determines that the proposed change might have an adverse effect, it is required to publish notice of the proposal, allow the filing of objections and then provide for a hearing.

The right to the use of water, whether under a permit or an existing right, passes with a conveyance of the property to which it is appurtenant unless specifically excepted. A person receiving an appropriation interest must notify DNRC of the conveyance. An appropriator may not sever a water right from the land to which it is appurtenant, sell a right for other purposes or to other lands, or make the right appurtenant to other lands without prior approval of DNRC. Such changes may be approved if the rights of others would not be adversely affected.

An appropriator may abandon a water right by ceasing to use it, with the intent of wholly or partially abandoning it. On streams adjudicated and rights granted pursuant to the 1973 Water Use Act there is a statutory *prima facie* presumption that a right has been abandoned following a period of ten successive years nonuse.

Reservations

The Water Use Act allows the state or any political subdivision or agency thereof, or the United States or any agency thereof, to apply for and receive a reservation of water. Reservations may be granted for existing or future beneficial uses or to maintain a minimum flow, level or quality of water throughout the year or at other specified periods of time. Water may be reserved upon showing the purpose and need for the reservation, the amount of water required and establishing that the reservation is in the public interest. The priority of a reservation dates from the date of the order granting it.

A reservation may not affect any existing rights, but after adoption of a reservation DNRC may reject an application for a permit which would appropriate reserved waters. A reservation must be reviewed at least every ten years to ensure that the objectives of the reservation are being met. If not, the reservation may be revoked or modified.

Existing Water Rights

An existing water right is any right to the use of water which would be protected under the law as it existed upon adoption of the Water Use Act (July 1, 1973). Thus, while many of the prior statutes on

water rights have been repealed, all prior Montana water laws (both statutes and court decisions) are relevant because the constitution specifically recognizes and confirms all existing water rights.

GROUND WATER

The ground water laws were passed in 1962 and subsequently modified by the 1973 Water Use Act. The application of ground water to a beneficial use prior to January 1, 1962 was recognized as a water right with surface rights having a priority date preceding January 1, 1962 taking priority over all prior or subsequent ground water rights.

Notices of ground water appropriation and completion of ground water appropriations made prior to the 1973 Water Use Act must be filed with County Clerks by the appropriator on forms provided to the clerk by DNRC. All ground water appropriations since the passage of the 1973 Water Use Act must follow the procedures set forth in that act except for wells or developed springs yielding less than 100 gallons of water per minute.

CONTROLLED GROUND WATER AREAS

Montana's statutes regulating controlled ground water areas were enacted in 1961 in an attempt to bring critical ground water areas under a permit appropriation system. A controlled ground water area is the only area within which all ground water appropriators are required to secure a permit. Otherwise, only persons appropriating water from wells yielding more than 100 gallons per minute are required to receive permits.

A controlled ground water area may be proposed to the Board of Natural Resources and Con-

servation by the department or by a petition signed by at least twenty or one-fourth (whichever is smaller) of the ground water users in the proposed area. Factual data must be presented to the board showing that:

- 1- ground water withdrawals exceed recharge;
- 2- excessive ground water withdrawals are likely to occur in the near future because of consistent and significant increases in withdrawals; and
- 3- significant disputes exist regarding priorities, amount of ground water in use or priority of type of use.

Upon receipt of a petition, DNRC must compile all information available concerning ground water and ground water use in the proposed area. After due notice, a public hearing is held at which the department presents the information it has collected and at which interested persons may also be heard. If the board finds that withdrawal of ground water in the area exceeds the safe annual yield from recharge, it must order the aggregate annual withdrawals to be decreased. Except for domestic uses, all such decreases must conform to the priority rights and prevail for the duration of the shortage. All new appropriations of ground water within the area may be made only after receipt of a permit from the department.

WATER DISTRICTS IN MONTANA

Montana law provides for five principal types of districts that may be established for the general purpose of studying, planning and promoting the development and conservation of water and related land resources and providing flood control. These are: (1) county water and sewer districts, (2) drainage

districts, (3) irrigation districts, (4) conservation districts and (5) conservancy districts.

In addition to districts there are two corporate types of organizations which may be formed for water development in Montana. These are water

users associations and canal companies. Most irrigation development in Montana has been accomplished through these private types of development.

COUNTY WATER AND SEWER DISTRICTS

County water districts in Montana may be formed by any combination of counties and cities or portions of those political divisions, including unincorporated territory, having not less than 200 inhabitants. Petitions to form a county water district must be signed by ten percent of the registered voters in the proposed district. Any district incorporated has the power to acquire, operate and maintain water rights, water and sewer works and other rights useful or necessary for the storage, conservation, supply and conveyance of water useful for purposes beneficial to the district. Incorporated districts may accept assistance from public and private sources, borrow money, incur bonded indebtedness and levy taxes.

DRAINAGE DISTRICTS

Drainage districts in Montana are formed for particular projects. Once created, however, they may be expanded. Drainage districts are under the jurisdiction of the judge of the district court who may create the drainage district and appoint the commissioners. Drainage districts may be created to (1) construct drains, ditches and levees across the lands of others or to straighten or otherwise alter any natural stream or watercourse not navigable, for the promotion of public health or welfare or (2) maintain and keep in repair such works previously constructed. Drainage districts have the power of taxation and they may also assess lands that have benefited from the districts' projects.

IRRIGATION DISTRICTS

Irrigation districts may be formed to cooperate with the U.S. government under federal reclamation laws for the purposes of constructing irrigation works (including drainage) and purchasing, extending and maintaining constructed works. Sixty per-

cent of the landholders whose land could be irrigated from the district and whose title or evidence constitutes 60 percent of the land must make the petition for an irrigation district to the district court. A copy of the petition and all other associated maps and papers filed must also be filed with DNRC. At the time of the filing in district court the Board of Natural Resources and Conservation must present reports on engineering features involved, possibilities for water supplies and a copy of the decree of the district court showing any adjudicated water rights involved.

CONSERVATION DISTRICTS

Any ten occupiers of land lying within the limits of the area proposed to become a conservation district may petition DNRC to form a district. A conservation district is both corporate and politically governed by five supervisors appropriately elected. The districts are coordinated through the department.

Some reasons why conservation districts may be formed are: to develop comprehensive district plans for soil and water conservation; to control flooding; to undertake demonstration projects; to construct, improve and operate structures as may be necessary for authorized operations and to conduct research on soil erosion, floods and sedimentation.

CONSERVANCY DISTRICTS

Water conservancy districts may be formed to undertake a wide variety of water conservation purposes. These purposes include flood control, erosion and sedimentation control; drainage; fish, wildlife and recreation; and water conservation, development and utilization. A water conservancy district may be proposed by petition to DNRC, which must then undertake detailed feasibility studies. If formation of the proposed district is found to be feasible, DNRC will petition the district court to organize the conservancy district and appoint the initial directors. An organized district may tax real property and issue bonds to finance its projects.

FLOOD CONTROL (Title 76, Chapter 5, MCA)

Counties and municipalities may individually or jointly engage in flood control and prevention work through their governing bodies or through and with the cooperation of an appropriate water district. For purposes of flood control and prevention projects

typical powers such as property acquisition and condemnation, acceptance of aid, special assessments and contractual indebtedness are specifically granted to counties and municipalities.

STATE WATER PROGRAMS

WATER CONSERVATION BOARD ACT

The State sponsors, finances and constructs various water development projects under the Water Conservation Board Act (85-1-101 et seq., MCA). The act now empowers DNRC, with approval of the board, to investigate the feasibility of projects, arrange for their financing and for repayment of the investment through sale of water to water users' associations.

STATE WATER PLANNING (85-1-203 MCA)

The department is responsible for the state's comprehensive water plan. The department's planning program also involves representing Montana in interstate water planning and coordinating local, state and federal water development and planning.

WEATHER MODIFICATION (Title 85, Chapter 3, MCA)

DNRC is responsible for reviewing all applications for weather modification activities in Montana and must make its recommendations to the board, who in turn shall award licenses and/or permits to such applicants if deemed qualified under the rules and guidelines established by the board.

DAM SAFETY (Title 85, Chapter 15, MCA)

The department has jurisdiction over all non-federal dams impounding fifty acre-feet of water or

more, or that are 25 feet or more in height to insure that such structures present no potential hazards.

RENEWABLE RESOURCE DEVELOPMENT (Title 90, Chapter 2, MCA)

The Water Resources Division administers the Renewable Resource Development Program whose purpose is to promote the development of non-depletable resources in Montana through low interest loans and grants.

YELLOWSTONE RIVER COMPACT (Title 85, Chapter 20, MCA)

The Yellowstone River Compact was entered into by the states of Montana, Wyoming and North Dakota and approved by Congress in the early 1950's. This act established a commission between the states of Wyoming and Montana to administer the compact and divide the unused and unappropriated waters of the Yellowstone River basin.

The allocation and appropriation of water from the major interstate tributaries to the Yellowstone River follows:

	Montana	Wyoming
Clark Fork Yellowstone River	40%	60%
Bighorn River ¹	20%	80%
Tongue River	60%	40%
Powder River	58%	42%

¹Exclusive of the Little Bighorn River

EXPENDITURES

The budget for the Water Resources Division of the Department of Natural Resources and Conservation is appropriated at the division level. This means that the entire division is treated as one program with one general fund appropriation. However, for fiscal reports and managerial purposes DNRC management utilizes the Statewide Budget and Accounting System (SBAS) to record expenditures at the sub-program level.

★ Table II-1 shows the entire Water Resources division budget and the level at which 1978 and 1979 funds have been appropriated by the legislature. Funding as requested in the Governor's executive budget for fiscal years 1980 and 1981 is also shown.

★ Table II-2 reflects the fiscal year 1978 budget for the major subdivisions of the division.

★ Table II-3 breaks the division's budget down to the subprogram level. A brief description of each of the subprograms displayed in Table II-3 follows:

ENGINEERING

- Floodway Management: All costs associated with administering the Montana Floodway Management Act.
- Water Projects-General: The costs of administering state-owned water projects.
- Hamilton Field Operations: Costs of the Hamilton field office not directly chargeable to Daly Ditches.
- Daly Ditches: All costs incurred by the division which should be charged to the users of the Daly Ditches.
- Painted Rocks: Costs directly incurred in operating and maintaining the dam and reservoir at Painted Rocks, south of Hamilton.
- Sorinson Legal: Department costs incurred in the Sorinson vs. Montana lawsuit on the Sydney Project.
- Tongue River-Spring Creek: Costs incurred in evaluating the Spring Creek Coal Company requested lease on DNRC land.
- Tongue River-Flood Inspections: Costs incurred during May and June 1978 flood on the Tongue River.
- Professional Studies-General: Professional assistance to other department programs.
- Hydrography: Costs associated with monitoring streamflow levels in Montana and maintaining measuring stations.
- Hughesville Demonstration: A federally funded study of acid mine drainage problems on Galena Creek near Hughesville.
- Cooke City Feasibility: A federally funded study of acid mine drainage problems in the Cooke City area.
- Livingston Ditch-Highway Department: Reimbursable expenses associated with the repair of damage to the Livingston Ditch caused by construction of new highways.

- Hydropower State Projects: Costs incurred in studying the feasibility of generating electricity on state owned dams.
- Dam Safety Inspections: Costs incurred for dam safety inspections on privately owned dams.
- Renewable Resource Development: Costs incurred in administering the RRD program.
- Technical Assistance Program: Costs incurred by department personnel in carrying out engineering and economic analysis of potential water projects in Montana.

WATER RIGHTS

- New Appropriations: Costs incurred in processing of new water rights applications.
- Yellowstone Reservation Requests: Yellowstone River reservations hearing process incurred costs.
- Adjudication-General: Costs incurred in adjudication of existing water rights which are not directly associated with a basin and sub-basin.
- Adjudication-Powder River: Costs incurred in the adjudication of the Powder River basin.
- Adjudication-Tongue River: Costs incurred in the adjudication of the Tongue River basin.
- Adjudication-Big Horn River: Costs incurred in the adjudication of the Big Horn River basin.
- Water Rights Records: Costs incurred for maintaining a centralized water rights record system for Montana.

WATER PLANNING

- Water Planning-General: All costs incurred in water planning activities not directly associated with special projects.
- Yellowstone River Reservations: Expenditures for preparing Yellowstone River Reservations environmental impact statement.
- Poplar River-USBR: Costs incurred by department in participating in the International Poplar River Water Quality Board and in five study committees.

- Poplar River-EPA: Costs incurred in preparing report of Poplar River uses for Environmental Protection Agency.
- Tongue-Powder-HJR 22: Costs incurred in investigating water development potential in the Tongue and Powder river basins.
- Big Hole-HJR 80: Costs of evaluating the off-stream storage potential on Big Hole River.
- Upper Missouri Level B: Costs incurred in preparing a comprehensive plan for the Upper Missouri River basin.
- Upper Missouri Cooperative Irrigation Study: Costs incurred in identifying all potential irrigation projects in the Upper Missouri basin.
- Yellowstone River Compact: Costs incurred in determining Montana's and Wyoming's water share of the Yellowstone River and tributaries.
- Libby Reregulating Dam: Funds expended on a study of the reregulating dam proposed by the Corps of Engineers.
- MRBC 13(A) Study: Costs incurred in studying water available for emerging coal technologies in the Yellowstone Basin.
- Yellowstone Old West Study: Costs incurred in preparing reports for the Old West Regional Commission evaluating the effects of water withdrawal from the Yellowstone Basin.

ATMOSPHERIC SCIENCES

- All costs associated with administering the Montana Weather Modification Act and the HIPLEX program at Miles City.

ENVIRONMENTAL IMPACT STATEMENTS

- Studies performed to meet requirements set forth in the Montana Environmental Policy Act.

COMPREHENSIVE EMPLOYMENT TRAINING ACT

- CETA employees working for the division.

TABLE II-1 WATER RESOURCES DIVISION BUDGET
(Fiscal Years 1978-1981)

	1978	1979	Fiscal Year 1980	1981
	Actual	Anticipated	Requested	Requested
Personal Services	\$1,541,258	\$1,499,988	\$1,431,937	\$1,435,365
Contracted Services	280,711	260,018	653,130	708,923
Supplies & Materials	49,891	45,000	49,500	52,362
Communication	69,889	75,880	80,643	85,495
Travel	98,321	96,229	98,898	98,988
Rent	46,209	48,000	50,880	53,933
Utilities	1,443	1,530	1,622	1,719
Repair & Maintenance	16,248	17,223	18,256	19,351
Other Expenses	77,599	78,120	84,307	89,375
Equipment	33,472	45,000	42,200	15,850
Capital Outlay	34,152	130,000	75,000	575,000
Grants	160,000	390,000		
TOTAL	\$2,409,193	\$2,686,988	\$2,586,373	\$3,136,361

TABLE II-2 WATER RESOURCES DIVISION MAJOR SUBDIVISION BUDGET
(Fiscal Year Ending June 30, 1978)

	Water Engineering	Water Rights	Water Planning	Atmospheric Sciences	CETA	Yellowstone Reservation EIS
Personal Services	\$378,081	\$583,349	\$185,688	\$134,446	\$204,741	\$25,348
Contracted Services	149,644	43,642	32,314	49,560	205	5,346
Supplies & Materials	19,982	15,717	3,152	11,040		
Communications	8,084	54,267	8,713	1,757	2	(2,934)
Travel	30,499	36,360	24,200	6,709	490	63
Rent	25,184	8,320	45	12,660		
Utilities	1,042	313		87		
Repair & Maintenance	10,547	3,583	560	1,558		
Other Expenses	1,808	5,086	68,732	1,973		
Equipment	17,417	12,522	450	3,083		
Capital Outlay: Land	15,841					
Buildings	5,000					
Other Improvements	13,311					
Grants	160,000					
TOTAL	\$836,440	\$763,159	\$323,854	\$222,873	\$205,438	\$27,823

TABLE II-3 WATER RESOURCES DIVISION SUBPROGRAM BUDGET
(Fiscal Year Ending June 30, 1978)

ENGINEERING

	Floodway Manage- ment	Water Projects- General	Hamilton Field Operations	Daly Ditches	Painted Rocks	Sorinson Legal
Personal Services	\$39,171	\$ 98,846	\$22,699	\$69,283	\$ 2,690	\$ 103
Contracted Services	1,647	30,315	1,604	774	74	12,839
Supplies & Materials	519	2,846	7,212	3,973	56	
Communications	1,028	4,487	436	235	152	
Travel	3,462	8,746	2,868	62	275	
Rent	25	1,941	44	174		
Utilities		33		1,010		
Repair & Maintenance	459	978	3,821	3,992	115	
Other Expenses	279	429	43	65		
Equipment		245	16,781			
Capital Outlay						
Land & Interest on Land		15,841				
Buildings		5,000				
Other Improvements		13,311				
Grants						
TOTAL	\$46,590	\$183,018	\$55,508	\$79,568	\$3,362	\$12,942

	Tongue River Spring Creek	Tongue River Flood Inspections	Professional Studies General	Hydro- graphy	Hughesville Demonstra- tion	Cooke City Feasibility
Personal Services	\$ 696	\$ 7,828	\$ 12,740	\$46,313	\$2,175	\$325
Contracted Services	33	2,205	85,349	2,493	8	
Supplies & Materials	19	1,460	387	2,810	17	
Communications	1	94	320	211	12	
Travel	448	2,108	1,304	5,106	264	
Rent			12,874	244		
Utilities						
Repair & Maintenance	23	105	127	927		
Other Expenses			421	459		
Equipment				265		
Capital Outlay						
Land & Interest on Land						
Buildings						
Other Improvements						
Grants						
TOTAL	\$1,220	\$13,800	\$113,522	\$58,828	\$2,476	\$325

	Livingston Ditch- Highway Department	Hydropower State Projects	Dam Safety Inspections	Renewable Resource Develop- ment	Technical Assistance Program
Personal Services	\$3,326	\$ 369	\$24,625	\$ 23,282	\$23,612
Contracted Services	72	5,000	6,590	265	376
Supplies & Materials	3		427	197	56
Communications	159	12	164	642	133
Travel	1,155		2,623	1,501	576
Rent			245	2,698	6,939
Utilities		33			
Repair & Maintenance				12	
Other Expenses					100
Equipment			126		
Capital Outlay					
Land & Interest on Land					
Buildings					
Other Improvements					
Grants				160,000	
TOTAL	\$4,715	\$5,381	\$34,800	\$188,597	\$31,792

WATER RIGHTS

	New Appropriations	Yellowstone Reservation Requests	Adjudication- General	Adjudication- Powder River	Adjudication- Tongue River	Adjudication- Big Horn River	Water Rights Records
Personal Services	\$349,509	\$21,753	\$59,911	\$135,485	\$512	\$1,246	\$36,685
Contracted Services	26,366	5,027	6,328	7,286		4	3,658
Supplies & Materials	8,608		516	3,555	18	54	2,965
Communications	46,980	(3,149)	2,291	4,993			3
Travel	24,952	(391)	3,389	7,861		9	148
Rent	2,365		162	5,548			244
Utilities	79			234			
Repair & Maintenance	2,417		305	807		13	40
Other Expenses	2,252		228	2,551			55
Equipment	964			7,731			3,827
Capital Outlay							
Land & Interest on Land							
Buildings							
Other Improvements							
Grants							
TOTAL	\$464,492	\$23,240	\$73,130	\$176,051	\$530	\$1,326	\$47,625

WATER PLANNING

	Water Planning- General	Yellowstone River Reserva- tions	Poplar River USBR	Poplar River EPA	Tongue Powder- HJR 22	Big Hole HJR 80
Personal Services	\$113,091	\$1,730	\$ 9,987	\$ 8,809	\$ 2,008	\$9,233
Contracted Services	14,874	318	92	309		172
Supplies & Materials	2,914		49	4		8
Communications	8,430	215	29	146		23
Travel	11,073	340	8,788	1,496		225
Rent			25			20
Utilities						
Repair & Maintenance	454					
Other Expenses	68,592		28			
Equipment	450					
Capital Outlay						
Land & Interest on Land						
Buildings						
Other Improvements						
Grants						
TOTAL	\$219,878	\$2,603	\$18,998	\$10,764	\$2,008	\$9,681

	Upper Missouri Level B	Upper Missouri Cooperative Irrigation Study	Yellow River Compact	Libby Reregula- ting Dam	MRBC 13(A) Study	Yellowstone Old West Study
Personal Services	\$8,455	\$1,965	\$4,404	\$1,091	\$1,132	\$25,509
Contracted Services	94	436			1,856	14,482
Supplies & Materials	19		5			153
Communications	32		10	16		27
Travel	1,210	219	690	92	67	341
Rent						
Utilities						
Repair & Maintenance						106
Other Expenses	100					12
Equipment						
Capital Outlay						
Land & Interest on Land						
Buildings						
Other Improvements						
Grants						
TOTAL	\$9,910	\$2,620	\$5,109	\$1,199	\$3,055	\$40,630

**ATMOSPHERIC SCIENCES, ENVIRONMENTAL IMPACT STATEMENT,
COMPREHENSIVE EMPLOYMENT TRAINING ACT**

	Atmos- pheric Sciences	Environ- mental Impact Statement	CETA	Total
Personal Services	\$134,446	\$1,865	\$204,741	\$1,511,650
Contracted Services	49,560		205	280,711
Supplies & Materials	11,040			49,890
Communications	1,757		2	69,891
Travel	6,709	114	490	98,320
Rent	12,660			46,208
Utilities	87			1,443
Repair & Maintenance	1,558			16,259
Other Expenses	1,973			77,587
Equipment	3,083			33,472
Capital Outlay				
Land & Interest on Land				15,841
Buildings				5,000
Other Improvements				13,311
Grants				160,000
TOTAL	\$222,873	\$1,979	\$205,438	\$2,379,583
				29,610*
				\$2,409,193

*Time spent by Water Resources Division personnel in other DNRC programs.



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